

## HORTICULTURAL ABSTRACTS.

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Initialled reviews in the present number are by V. L. S. Charley of Long Ashton Research Station, and by M. H. Moore of the East Malling Research Station.

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## Horticultural Abstracts

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No. 3

## MISCELLANEOUS.

*Review.*

727. BRIERLEY, W. B.

016 : 575/577

**Science of the year—1938. The biological sciences.**Reprinted from *Ann. Regist. agric. Exp.*, 1938, pp. 368-78.

The following notes are taken from the pages devoted to botany. There was advance in 1938 in knowledge of the plant cell. Much attention was paid to the chemical constituents of plants and especially to plant pigments. Work on root culture *in vitro* showed that root pressure is probably a primary factor in the rise of sap and that the green top supplies aneurin to the roots. Work on hormones indicates that the hormonal control of plant functioning is less specialized than in animals. Knowledge advanced of the influence of one fruit on another in stored fruits of different degrees of maturity, and of their vitamin development during storage. Preservation of delicate fruits by quick freezing in sugar was commercialized. Plant injection for diagnostic and curative purposes was given attention. Research on deficiency diseases, especially those concerned with boron and copper made progress. The practical use of water cultures was tested.

## Growth-promoting substances.\*

728. CHOUARD, P.

577.15.04 : 631.535

**Les hormones de bouturage. (Hormones and propagation from cuttings.)***Rev. hort., Paris, 1938, 26 : 99-103, bibl. 11.*

A brief account is given of the production of growth promoting substances by the plant itself, their action and nature, artificial production and use. Notes are given of the difficulties which beset those wishing to use these substances when propagating plants and of the many factors which need consideration when so doing.

729. CHOUARD, P.

577.15.04 : 631.535

Production expérimentale de bourgeons sous l'effet des hétéro-auxines.

**(Shoot production by means of hetero-auxin.)***C.R. Acad. Sci., Paris, 1938, 206 : 1401, bibl. 13.*

Using, as before, leaves of *Alloplectus Lynchii* and *Begonia rex* the author tried different doses of indole-3-acetic acid. With a concentration of  $16\gamma$  per c.c. nothing out of the ordinary occurred, and with  $50\gamma$  per c.c. transport between the poles changed and roots appeared at the distal pole, a phenomenon previously observed by other workers, but with this concentration there also appeared a new phenomenon, namely the appearance of numerous shoots, formed *de novo* at the distal pole and arising generally at the points where the hormone entered near the places where the leaf venation was cut. An even stronger concentration, viz.  $150\gamma$  per c.c. or the use of indole-3-butyric acid at  $50\gamma$  per c.c. resulted in much greater root formation at the apical pole, but retarded or even inhibited shoot formation. It was found that, if the hormones

\* See also 843, 1014, 1098.

are introduced at the basal pole, they there bring about a root proliferation proportionate to their concentration. But if root formation is not excessive, as for instance when 50 $\gamma$  per c.c. indole-3-acetic acid is used, the formation of shoots, far from being inhibited, proceeds along the veins and edges of the leaves, more or less removed from the proximal pole. It is the first time in the knowledge of the author that formation of shoots has been correlated with the application of definite chemical substances, namely hetero-auxins, in which the possibility is shown of modifying at will the polarity of leaf cuttings.

730. CHOUARD, P. 577.15.04  
 Sur le rôle des auxines dans l'organogenèse des plantes vasculaires. (**The rôle of auxins in the origin of different organs of vascular plants.**)  
*Bull. Soc. bot. Fr.*, 1938, **85** : 546-55, bibl. 15.

The author describes his experiments with indole-acetic acid at concentrations of from 0.1-200 mg. per litre. What he calls normal conditions are temperature 15-20° C., humidity either dry air of the laboratory, i.e. about 50%, or very saturated air as under a bell glass; lighting diffused by day, dark by night; duration of treatment 12 hours to 15 days. Hence his two greatest variants are duration and concentration. By soaking in solutions of known strength and directing the active principle involved to chosen points by means of incisions and complementary soaking in pure water and by so placing his experimental material with regard to weight as to modify transpiration and diffusion currents he managed to localize exact doses at particular points in the leaves of *Alloplectus Lynchii*, *Begonia rex*, *Endymion non-scriptus* and *Brimeura amethystina*. By so doing he was able to induce the formation of buds or roots at any desired point on the leaves and in any desired order. He concludes from these results that auxins and hetero-auxins are not rhizocalines and are primarily not agents for the formation of plant parts, but only—in addition to their rôle of affecting cell elongation—very active agents in individual cell proliferation, which is the initial stage in the formation of every plant organ.

731. CHOUARD, P. 577.15.04 : 581.144  
 Sur la nature de l'excitation par les hétéro-auxines dans la formation provoquée de racines ou de bourgeons en n'importe quel point de boutures de feuilles. (**The nature of the stimulation produced by hetero-auxins in root and shoot formation.**)

*C.R. Acad. Sci. Paris*, 1938, **207** : 597, bibl. 8.

The author briefly describes the time taken to form roots, shoots and galls in leaves of *Alloplectus Lynchii*, *Begonia Rex* and *Endymion non-scriptus* treated with varying concentrations of indole-3-acetic acid, indole-3-butyric acid and  $\alpha$ -naphthalene-acetic acid. His results lead him to the conclusion that these substances are not identical or analogous to rhizocalines, i.e. true root formers, since, although they sometimes induce root formation, they often stimulate exclusively the growth of shoots. In the same way they cannot be considered as merely shoot-growth producers. The fact is that all this new growth, natural or induced, begins with hypertrophy of the tissues resulting in a simple gall, which then develops into a root or a shoot, after having first created a centre to which all the various products of leaf metabolism are attracted. Auxins and hetero-auxins undoubtedly stimulate this first phase, but the nature of the subsequent differentiation is the result of other factors. Hetero-auxins afford us a very powerful instrument whereby we can set in motion the complex phenomenon of the formation of plant organs and to a large extent direct their course.

732. WATKINS, J. V. 577.15.04 : 635.9  
**Further data on response of cuttings to Hormodin A\*.**

Reprinted from *Southern Florist and Nurseryman*, 1938 (? date) pp. 4.

The present report deals with the use of Hormodin A in varying doses and under varying environmental conditions on a number of species commonly used by nurserymen. Most of the species are flowering shrubs.

\* See also *H.A.*, 8 : 634.

733. CHOUARD, P. 577.15.04 : 631.535  
 Les hormones de croissance et leur emploi pratique, spécialement dans le bouturage. (**Growth hormones and their practical use, especially with cuttings.**)  
*Rev. Bot. appl.*, 1939, **19** : 255-70, 332-50, bibl. 36.  
 This article adds one more to the already very extensive output on the subject of plant hormones. It summarizes the work to date.

734. CALVINO, E. M. 577.15.04  
 Azione di sostanze rizogene su piante da fiore. (**Action of growth promoting substances on flowering plants.**)  
*Pubbl. Staz. sper. Floric. O. Raimondo, Sanremo*, **36**, 1939, pp. 24, bibl. 41.  
 In experiments on some 30 species and varieties at San Remo, 17 different substances were used on flowering plants to induce rooting from cuttings:—they included 6 synthetic chemical substances, 6 proprietary substances, 4 extracts of animal glands, permanganate of potash and two mosses, namely *Hypnum sericeum* and sphagnum. Most of them were applied in solution by immersing the base of the cuttings in them for 24 hours and then planting out in pure sand. Rhizofilo was applied in lanoline and the mosses were applied as bandages round the base of the cutting. No success was achieved with six species, but in most cases success resulted in measure which varied with the plant, the substance and environmental conditions. With certain exceptions in particular cases all the substances showed better results than the controls. The animal products showed definite root forming properties. Rooting of *Bougainvillea glabra* var. *Sanderiana* cuttings was greatly hastened by wrapping them in either of the mosses prior to planting. Results are given in detail. The author while recommending the use of such substances, gives a warning note that they will not achieve success unless used with all due regard to the essential physical and biological conditions necessary for the rooting of cuttings. They take the place or make good only one of the essential factors, i.e. the supply of rhizogenous substances which pre-exist in cuttings, but they cannot make up for lack of heat or for unsuitable soil conditions.

735. JAKEŠ, E., AND HEXNEROVÁ, H. 577.15.04 : 634.1/2-1.542  
 Über den Einfluss der Wuchsstoffe auf Wundgewebebildung bei Obstbäumen.  
 (**The influence of growth substances upon the callus formation on wounded fruit trees.**)  
*Gartenbauwiss.*, 1939, **13** : 83-93, bibl. 30.  
 Wounded cherry, plum, apple and pear trees treated with Belvitan and 1% hetero-auxin paste (a single thin coating at the wound) healed more rapidly than untreated, similarly wounded trees. Of two wounds on a single branch, 2 to 5 cm. apart, the beneficial effect of the paste was always more noticeable on the lower wound, i.e. on the wound nearer to the stem of the tree. Belvitan gave better results than hetero-auxin. This is ascribed to a possibly too strong concentration of the indolyl-acetic acid. The successful results of the experiment suggest the use of growth substances in horticultural practice for healing tree wounds.

736. OINOUE, Y. 581.163 : 577.15.04 : 634.1/8  
**Artificial parthenocarpy by means of heteroauxin.** [Japanese, English summary.]  
 Reprinted from *Nôgyo Oyobi Engei*, 1938, **12** : 21-6.  
 Hetero-auxin, 0.05% in lanolin, applied on either cut or uncut stigmas of emasculated flowers resulted in the formation of somewhat abnormally small seedless grapes in *V. vinifera* vines and in 50% seedless soft fruits in egg plant. A very small percentage of squash and water melon flowers formed parthenocarpic fruits. The author notes that parthenocarpy can also to a small extent be induced in the grape vine by means of oestrone (folliculin).

737. OLIVER, R. W. 577.15.04 : 638.16  
**Honey as a stimulant to the rooting of cuttings.**  
*Sci. Agric.*, 1939, 19 : 586-8.  
 The author has found that honey has a definitely stimulating effect on the rooting of cuttings of *Thuja occidentalis pyramidalis*, and of chrysanthemum. The best treatment consisted in standing the cuttings in a 25% solution of honey for 24 hours before planting. A higher percentage of cuttings rooted, and there were more roots per cutting; the response, moreover, was only very slightly less pronounced than that which followed most favourable hormone treatments. The substance or substances stimulating root formation have not yet been isolated from the honey.

*Various.*

738. CHOUARD, P. 631.544 : 631.588.1  
**Le forçage électrique en horticulture. (The use of electricity for forcing horticultural plants.)**

Reprinted from *Bull. "Sofina"*,\* Jan., 1939, pp. 35.

The author has divided his most useful paper into three parts. In the first he deals with the physiological principles which govern the action of light and heat in plants. The different chemical processes which take place in a plant, e.g. transpiration, circulation of liquids and the formation of chlorophyll, can all proceed best at particular temperatures. At the same time the formation of chlorophyll is intimately concerned with photosynthesis and this is particularly dependent on light and light intensity. Optimum heat conditions can be given and yet the plant may not be able to take full advantage of them unless it also has optimum light conditions. Hence the practice of heating in winter without lighting is generally to be deprecated. Other processes affected either by the duration or the quality of light or both include pigmentation, transpiration, nitrogenous nutrition, vitamin production and growth generally as influenced by length of day. But even if we can give optimum heat and light conditions, that is not all, and attention must be paid to conditions of the plant prior to the application of forcing methods. Thus plants may need defoliating, drying and treating with ether as in the case of lilac for the early market, or their rhizomes or bulbs may need special cold or heat treatment previously in order to attain the best results. Given, however, proper pre-treatment, electricity does afford a very reliable method of forcing.

In Part 2 the different methods of heating and lighting greenhouses and frames, either wholly or in part, with electricity are considered and illustrated. Special notes are given on using electricity to supplement the heat given by manure, on the use of electricity for seed beds, for raising endives and melons and for warming not only the soil, but also the air of frames. Electricity offers considerable scope for use in water cultures and it is used successfully if not yet economically in the so-called panneaux radiants or heat-radiating panels (see also *H.A.*, 7 : 4, 5 and 269). Different systems of lighting, suitable for use in forcing, are dealt with, among them the intermittent system, whereby the light automatically is switched off and on every few seconds. Systems most suitable for different crops are considered.

In Part 3 the author sums up the subject from an economic standpoint. Among essentials he counts the following:—Use of proved and economical apparatus only; retention of farm yard manure for use in mixed beds; application only to plants which will give an economic return; standardization of apparatus; lowering of electric current rates at particular hours and of the price of neon lamps; buying on easy terms; rationalization of electric supply to enable it to meet horticultural requirements; education of horticulturists to the proper use of electricity; continued research on optimum heat and light requirements.

\* i.e. Société financière de transports et d'entreprises industrielles.

739. JACCARD, P. 631.588.1  
 L'électrisation des plantes et son rendement dans l'électroculture. (**The electrifying of plants and its yield in electroculture.**)  
*Rev. hort., Paris, 1939, 26 : 457-61, bibl. 7.*  
 A brief review of the progress attained in the study of electroculture; by which is meant the stimulation of growth in plants by means of electricity passed into the atmosphere surrounding them or into the soil in which they are growing. Favourable results in increased growth and yield have been obtained from time to time, but they are uncertain and largely dependent on weather conditions. Plants on poor soil are little influenced, since electricity merely helps the plant to utilize to the full the resources available and does not provide either nutrients or energy.

740. GARVER, H. L. 631.588.1  
**Some things a farmer should know about electricity.**  
*Pop. Bull. Wash. agric. Exp. Stat., 157, 1939, pp. 40, bibl. 9.*  
 The stated purpose of this bulletin is to supply the layman with definitions of the more common electrical terms and give him such information about electricity and electrical wiring as will enable him to plan his wiring system adequately and economically and judge the finished work intelligently. This purpose is most adequately achieved and, even though some of the terms refer essentially to American apparatus, the commonsense suggestions made should be extremely useful to any horticulturist who uses electricity.

741. TEAKLE, L. J. H. 663.61 : 581.084.1  
**Hydroponics. The growth of crops in water without the use of soil.\***  
*J. Dep. Agric. W. Aust., 15 : 206-11, bibl. 6.*  
 The author gives the gist of the authoritative statements made in available reports on the growth of crops in water. The term hydroponics coined by Prof. Setchell of California University is designed to imply not only growth in water but the use of water for growth of crops on a commercial scale. For those wanting to try the method these hints should prove useful.

742. ARNON, D. I., AND HOAGLAND, D. R. 663.61 : 581.084.1  
**A comparison of water culture and soil as media for crop production.**  
 Reprinted from *Science, 1938, 89 : 512-4, bibl. 6.*  
 Experiments under controlled greenhouse conditions in the University of California were undertaken by the authors, whose comments on results include the following:—1. The average yields as well as the highest yields of individual tomato plants from soil and water cultures do not justify the conclusion that the potential crop yield is higher in a favourable nutrient solution than in a fertile soil. Nor was any evidence found in support of the claim that higher yields per unit of surface can be expected from the water culture technique as a result of closer spacing of plants than is possible in soil. 2. Heating the nutrient solution produced no great effect on the yield of tomatoes. A marked increase of yield of tomatoes from unheated nutrient solution resulted from continuous forced aeration. The beneficial effect of improved aeration was also reflected in the growth and yield of tomatoes in sand culture. 3. There is some indication that more water is required to produce a unit weight of fruit under water culture conditions than under soil conditions. 4. No significant difference has been found in the calcium, phosphorus, magnesium, potassium, nitrogen and sulphur content of fruit of several varieties of tomato grown in the greenhouse in fertile soil, sand and water culture media. Neither was there a marked difference in content of carotene (provitamin A) or vitamin C. 5. Plants grown by the water culture method are not thereby protected against diseases or insects attacking the aerial parts of plants. Results obtained, however, under competent supervision are likely to exceed those obtained under poor soil conditions, and the authors' conclusions confirm previous work indicating the possibility of producing crops on a large scale by water culture

\* See also *H.A., 8 : 1334.*

methods. The method appears to have commercial possibilities for growing high-priced, out of season crops.

743. ALLARD, H. A. 612.014.44  
**Complete or partial inhibition of flowering in certain plants when days are too short or too long.**

*J. agric. Res.*, 1938, 57 : 775-89.

A number of plants have been found of intermediate behaviour in that their flowering is favoured by lengths of day neither too short nor too long. The reactions to day length of some of these, namely *Mikania scandens*, *Phaseolus polystachyus*, *Eupatorium Torreyanum* and *Saccharum spontaneum* are discussed here. The last named, *S. spontaneum*, shows the narrowest flowering response known, lying between 12 and 14 hours of light each day. Any deviation from this results in no flowers being formed.

744. DENNIS, A. C., AND DENNIS, R. W. G. 546.27  
**Boron and plant life. Part III. Developments in agriculture and horticulture 1937-38.**

Reprinted from *Fertil. Feed. St. J.*, 1939, Feb. 8 and 22, March 8 and 22, April 5 and 19, pp. 19, bibl. (added in reprint) 193.

The authors in this article review mainly papers which deal with the confirmation of previous work on boron compounds and their function as plant nutrients and with investigations on plants, the rôle of boron with regard to which had not previously been estimated. Notes of papers on the following among other subjects are given:—boron in fertilizers; effect of water relations on boron deficiency diseases; effect of lime on expression of boron deficiencies; fate of boron in soil; connexion of boron with growth of beet, turnip, swede, apple, pear, citrus, celery, flax, leguminous crops, cauliflower, spinach, potato, tomato, tobacco, coffee, hop, carrot, lettuce, cotton, blueberry, taro, asparagus, and onion, and lastly the function of boron in the plant.

745. KRÜGEL, C., DREYSPRING, C., AND LOTTHAMMER, R. 546.273  
**Leaching experiments with borates.**

Reprinted from *Superphosphate*, 1938, 11 : 141-50, 161-6, bibl. 17.

It had been feared that the application of sufficient borates to control heart rot of beets and mangolds would in course of time result in harmful accumulation of boron in the soil. These percolation experiments carried out by the Hamburg Agricultural Experiment Station on seven different soils show that a large proportion of the boron, i.e. some 63-94%, is leached out in the same year and the remainder the following season. It should not therefore constitute any danger to cultivated crops.

746. BOBKOV, E. V., AND ZERLING, V. V. 546.27 : 581.162.3  
**Influence du bore sur le développement reproductif des plantes. (Boron and plant reproduction.)**

*Ann. agron.*, Paris, 1938, 9 : 174-84, bibl. 3.

The accumulation of boron in the stigmas of a great number of plants is discussed. In laboratory experiments the addition of boron greatly stimulated the germination of the pollen grains and increased the length of the pollen tube and in some cases the pollen would not germinate without it. Optimum concentrations for germination vary with the variety. It is noticeable that the reproductive organs of plants withstand very much higher concentrations than the vegetative parts. Other elements, e.g. manganese, zinc, iodine, uranium and copper, also exercise some influence on germination of pollen but much less than boron. The pollen of clover receiving boron through the soil germinated better than that of clover receiving none. The influence of added boron is shown most in increased seed production.

747. CRAFTS, A. S. 632.954

**The relation of nutrients to toxicity of arsenic, borax, and chlorate in soils.***J. agric. Res.*, 1939, 58 : 637-71, bibl. 14.

The tests described here were made in the attempt to discover some of the reasons for the varying efficacy of different herbicides. Kanota oats were grown in different soil mixtures and culture solutions and the effect on them of particular herbicides was noted. It was found that arsenic and boron toxicity are related primarily to textural grade of soil while chlorate toxicity is correlated with fertility. Seasonal changes in the response of plants to chlorates added to the soil may be explained on a basis of nitrate concentration as affected by leaching, temperature, absorption by plants and nitrification. Plant growth may be used for predicting response to chlorates and in highly fertile soils it is suggested for the control of weeds that the use of chlorates should be avoided and carbon bisulphide or special cultural practices substituted.

748. PARODI, L. 631.411.4

**Psammophytes argentines qui peuvent être employées pour fixer les dunes.  
(Psammophytes of the Argentine possibly suitable for consolidating sand dunes.)***Rev. Bot. appl.*, 1939, 19 : 389-95.

Certain Argentine plants are considered to be of value for the consolidation of sand dunes. The following have already been subjected to trial and have fulfilled expectations:—*Sporobolus rigens*, *Panicum racemosum*, *P. Urvilleanum*, *Spartina ciliata*, *Poa Barrosiana*, *Poa lanuginosa*, all being Gramineae; *Plazia argentea* (Compositae), *Adesmia incana* (Leguminosae). Notes are given on habits and methods of propagation. In addition a list is given of plants which might be associated with the foregoing. They are classified according to their habit of growth.

749. LANGHAM, W., AND McMILLEN, W. N. 631.67

**Deep well irrigation in the Oklahoma Panhandle.***Panhandle Bull.*, 1939, No. 64, pp. 22, bibl. 94.

Notes are given of costs of drilling a well, of operating it in the first year after completion, of results achieved from irrigating certain crops from it and of certain practical suggestions made as the result of initial trials.

750. ADAMS, R. L. 331 : 634/5

**Seasonal labor requirements for Californian crops.***Bull. Calif. agric. Exp. Stat.* 623, 1938, pp. 28.

Monthly requirements of agricultural labour in California in 1935-6 varied from a peak of 3.1 million man days in September to less than a million in the late winter or from 144,720 workers in September to 48,173 in March. Seasonal requirements for specific crops were variable, being least for field crops and greatest for fruit and truck crops. Some of the figures for crops needing high seasonal labour were:—carrots 22.1 man days for 9 hours per acre, hops 37.1, lettuce 8.4, pears 7.9, green peas 9.4, prunes 4.1, tomatoes 9.7, walnuts 1.1, lemons and oranges 21 man days per 1,000 boxes and onions 105 man days per ton. Details are given of how this labour was expended in the cultivation, harvesting and packing of the various crops.

751. JACQUOT, A. C. 631.083/4

**Diesel tractor engines.***Pop. Bull. Wash. agric. Exp. Stat.* 156, 1939, pp. 28.

In this bulletin the mechanism of the diesel engine is carefully and clearly explained and notes are given of the different types now in use. Reasons are suggested why it is thought that the diesel type will oust the older types of tractor.

752. HUTCHINSON, H. P. 634.973.623-1.8  
**The manuring of cricket bat willows.**

*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 249-53, bibl. 1.*

Forty-two 4-year-old bat willow trees, growing in block formation 27 feet apart on a non-flooding permanent meadow, the soil of which was a drift loam, formed the subject of manurial experiments. The addition of 2 lb. of sulphate of ammonia to each alternate tree in February, the month in which root growth begins in willows at Long Ashton, resulted in increase of volume of 80% as against an increase in volume of untreated trees of only 63%. The increase in timber due to 42 lb. of sulphate of ammonia is 4,325 cubic inches. If one assumes previous values for the timber and fertilizer, 3s. 6d. worth of fertilizer produced 52s. 6d. worth of timber.

753. OERTEL, A. C. 535.33  
**The spectrograph in relation to agricultural problems.**

*J. Aust. Inst. agric. Sci., 1938, 4 : 141-4.*

A brief account by a member of the Division of Soils, C.S.I.R., of the use of the spectrograph for the examination of soils and plant ash. When it is desired to determine mineral deficiencies in plant material no one element is usually selected for determination. The only method which appears suitable is the quantitative determination of each detectable element, followed by an attempt to find out which is constantly present in the healthy samples in an amount above a certain limit and in unhealthy samples in an amount below that limit. Only the spectrograph appears to offer some chance of determining this. Spectrographic soil analysis has the advantage of giving a complete survey of the composition. The record can, moreover, be filed for further reference. [A modification of the Ramage method is now in use at East Malling for the diagnosis of certain deficiency diseases in conjunction with plant injection methods. A new method applicable to many more minerals than the Ramage method has also now been standardized for routine use there.—ED.]

754. VINOGRADOV, A. P. 631.41 : 581.14

**Biogeochemical provinces.** [In English.]  
*C.R. Acad. Sci. U.R.S.S., 1938, 18 : 283-6.*

Effect of changes in chemical elementary composition of soils and water on flora and fauna.

BOROVIK, S., AND BOROVIK-ROMANOVA, T. 546.42

**A method of quantitative analysis of Sr in the ash of plants.**

*Trud. biogeochem. Lab. Acad. Sci. U.S.S.R., 1937, 4 : 259-64, bibl. 18.*

The method is the arc method, with vanadium as an internal standard.

NADEL, M. 581.49

Sur la mesure de l'ouverture des stomates. (**Measuring stomata with special reference to their fixation with alcohol**) and

Le mécanisme des échanges gazeux entre les végétaux et le milieu extérieur.

(**The mechanism of gaseous exchange between plants and the atmosphere.**)

*Thèses présentées à la faculté des sciences de l'université de Paris pour obtenir le titre de docteur.* M. Shoham, Tel-Aviv, Palestine, 1938, pp. 65 + 7, bibl. 62.

WEAVER, D. S., AND ELLIS, H. M. 631.459

**Terracing to reduce erosion.**

*Ext. Circ. N.C. agric. Exp. Stat. 222, 1938, pp. 29.*

Directions for undertaking.

TEAKLE, L. J. H. 631.459

**Soil erosion. The construction of contour banks.**

*J. Dep. Agric. W. Aust., 1938, 15 : 346-55.*

Directions for making contour banks.

TANAKA, T. 63(52)

**Foundation of agriculture of Japan through research, experimentation, and education.**

*Philipp. Agric., 1938, 27 : 396-404.*

## TREE FRUITS, DECIDUOUS.

## General.

755. BARTHELET, J., AND DESAYMARD, P. 634.1/7 : 581.084

Les stations de recherches d'arboriculture fruitière en Angleterre. (Fruit research stations in England.)

*Ann. Épiphyt. Phytogén.*, 1938, 4 : 565-88.

This brief but clear account of the work of the two chief fruit research stations in England, namely those at Long Ashton and East Malling, is recommended to our French readers who are interested in English methods.

756. SAVASTANO, G. 634.1/9

Arboricoltura—lineamenti. (An outline of arboriculture.)

Reprinted from *Ann. Staz. sper. Olivicoltura, Pescara*, 1939, pp. 63.

This is not a manual for the practical man. It appears rather to be written to show the non-agriculturist and possibly also the non-tree-growing agriculturist the problems which confront the fruitgrower. It might well suffice to turn the thoughts of the aspiring but doubtful agriculturist to fruitgrowing, so clearly are set out not only the operations which the fruitgrower must carry out but also the temperamental equipment necessary for success. To quote one small sentence, "The perfect fruitgrower should have in him something of a physiologist, a pathologist and an economist, he should be versatile but positive, a revolutionary in thought, but conservative and careful in action."

757. VASILIEV, K. V. 634.1/8

Fruit growing in Khorezma Region of Uzbekistan. [Russian.]

*Trud. Samarkand agric. Exp. Stat.*, 4, 1938, pp. 86, bibl. 10.

Khorezma climate, a characteristic of which is a lengthy period without frosts, permits the cultivation of practically all Central Asiatic fruits as well as certain subtropical fruits such as fig and pomegranate. The apricot occupies the most important place among the fruits grown in Khorezma (57.15%) and hence it is dealt with rather more fully. All apricots grown in Khorezma belong to the species *Prunus armeniaca* L.

758. KUZNETSOV, V. V., VASILIEV, K. V., KUL'CHITSKY, V. V., 634.1/8

DRBOGLAV, YU. A., AND DYLEVSKY, A. A.

Fruit strains in the Uzbekistan. [Russian.]

*Trud. Samarkand agric. Exp. Sta.*, 3, 1938, pp. 174, bibl. 43.

The more important fruit grown in Uzbekistan are apricots (49.3%), apples (22.1%), cherries (5.8%), peaches (3.9%), pears (2.6%), walnuts (2%), quinces (1.7%), pomegranates (1.6%), figs (1%), other fruits (10%). Much of the fruit is exported fresh, dried or canned.

759. WARCOLLIER, G. 634.1/7 + 663.3

Considerations générales sur l'état actuel de la pomologie et de la cidrologie en France. (The present position of pomology and cider manufacture in France.)

*Ann. agron., Paris*, 1938, 8 : 655-89, bibl. 36.

The author, who is Director of the pomological research station at Caen, discusses the conditions and the cultural and cider making methods of France. Soils and climates of the various apple and pear districts of France are described. Trees are grown with all kinds of spacing, that advocated in this paper is current in Normandy, being 12 m.  $\times$  12 m. Where the pasture beneath the trees is also an economic consideration the spacing may be up to 20 m.  $\times$  20 m. The growing of orchard trees on land devoted to annual crops and, therefore, frequently worked is too common. The trees suffer considerably from mechanical injuries, while the yield of the associated crops is also reduced. Rootstocks are obtained from the seeds of pressed apples.

Only stocks having a circumference of 12-15 mm. at a year old are used. Strong growing scion varieties are grafted low down, the less robust sorts higher up. Double working is common, the best intermediates being President Descours-Desacres, Pomme d'Or, Transparente de Croncels, Railé Précoce. Neither selection of seedling stocks nor the use of intermediates can ensure uniformity. Root grafting on free stock is coming into practice in certain districts and does appear to obtain more even results. The results obtained at East Malling and Long Ashton with vegetatively raised stocks are briefly set out. Pollination studies for cider apples seem unnecessary. The planted districts contain so many varieties in juxtaposition that causes of continued sterility are non-existent. The action of various manures is discussed. Although not much practised the sowing of manures in strips down the middle of the orchard aisles is advocated. An instance is given of the complete renovation of a failing orchard by this means. Liquid manure is particularly valuable in grass orchards. The proper spring spraying of cider apple trees is usually quite impossible owing to the low price obtained for even the best fruit, but the trees are sometimes winter sprayed. The processing and storage of cider apples is then discussed. The use of unripe apples, and the custom of leaving them in heaps underneath the trees until required are practices which react adversely on the quality of the cider; storage should be in open granaries where the temperature of the centre of the heaps is 5°-6° lower than that of heaps in closed stores. The article also discusses the influence of climate, aspect and variety on the quality of cider.

760. DESAYMARD, P. 634.1/7  
*La production fruitière en Auvergne et son amélioration. (Fruit production in Auvergne and its improvement.)*  
*Ann. agron., Paris, 1938, 8 : 68-87.*

The heavy drop in the export of fruit from France and the greatly increased imports are discussed. Improved methods of culture are essential, and the vital necessity of research stations is stressed. In this article the problem is discussed for the province of Auvergne. An account is given of current practice and suggestions are made for its improvement.

761. D.S.I.R. NEW ZEALAND. (ATKINSON, J. D., AND HYDE, W. C.) 634.1/5 + 635.1/7  
*Land utilization report of the Heretaunga Plains.*  
*Bull. Dep. sci. industr. Res. N.Z. 70, 1939, pp. 111.*

The history and present position of fruitgrowing in Hawkes Bay and some of the problems encountered are dealt with by Atkinson in pages 70-102 and the development of market gardening by Hyde in pages 103-111.

762. MITCHURIN, I. V. 634.1/2-1.521  
*The best fruit varieties for Russia proper.* [Russian.]  
*Mitchurin's selected works, Voronezh Region, Publishers, Voronezh, 1939, pp. 315-50.*  
 12 roubles.

Some of the great selectionist's new fruit varieties are described. They produce both better quality fruit than old established Russian varieties and are at the same time sufficiently hardy for cultivation in Central Russia. They include 7 apple, 5 pear, 2 cherry, 3 plum, 2 apricot, 1 blackberry and 1 raspberry varieties.

763. JOHANSSON, E., AND ÖSTLIND, N. 634.11  
*Sortförsök med äppelträd vid Alnarp. (Apple variety trials at Alnarp, Sweden.)*  
 Reprinted from *Årsskr. Alnarps Lantbruks-Inst.*, 1938, No. 3, pp. 18.

This is a report of the cropping and growth of some 50 apple varieties including a fair number of commercial English varieties at Alnarp, South Sweden, during 1918 and 1938. Originally 8 trees of each variety were planted, but half were removed in the winter of 1924-5. The soil

was a light sandy loam and the rootstock was probably of the same type as E.M. IV with the exception of Gravenstein and Akero planted in 1922 on E.M.IX. In the first 5 years Lord Suffield, Keswick Codlin and Boiken cropped most heavily. At the end of ten years Lord Suffield still led and was followed by Ecklinville and Boiken. After 15 years Husmoder (named after Mère de Ménage, but actually not that variety) was first, Boiken being second and Allington third. In 1938 Husmoder was easily first, Cox's Pomona coming second, Allington being first among good dessert varieties. Full details are given of crops and heights and spreads of the different varieties.

764. KRUMBHOLZ, G. 634.11 : 581.46

Beiträge zur Morphologie der Apfelblüte. II. Über die Eignung der Blütenmerkmale zur Sortenbeschreibung. (Contributions to the study of the morphology of the apple blossom. II. On the suitability of flower characters for varietal descriptions.)

*Gartenbauwiss.*, 1939, 13 : 1-65, bibl. 19.

The object of the studies described here is to work out eventually a system which will show the genetic relationships between the different apple varieties more clearly than the pomological systems hitherto used. The system which is based on flower characters, is thought to be more satisfactory than that based on characters of the vegetative organs or fruits. The difficulties which are likely to arise from the use of this system are pointed out. The varieties studied were divided into 18 groups according to the shape of the petals and sepals, the relative length of the pistils, the pubescence and the extent of union of the ends of the pistil and the shape of the stigma.

765. HEISIG, C. P., AND PUBOLS, B. H. 634.1/8

**Fruit trees in Yakima County, Washington.**

*Bull. Wash. agric. Exp. Stat.*, 359, 1938, pp. 58.

Yakima County, Washington, is the largest fruit-producing county in the U.S.A. with a population of some 4 million fruit trees. *Apples*. The most common individual varieties are Winesap and Delicious, with increasing emphasis on the latter. *Pears*. Bartlett, about 75% of all pear trees, with Anjou gaining ground against other varieties. *Peaches*. Elberta most popular with Hale gaining ground rapidly. *Cherries*. Bing variety predominant and increasing its hold, followed by Royal Anne and Lambert. *Prunes and plums*. These constitute about 4% only of all fruit trees in the county. *Apricots*. About same number as of plums and prunes. In general apple, plum and prune numbers have decreased lately and other species of fruit have increased.

766. RUFENER, W. W. 634.1/2

**Fruit trees in the Wenatchee-Okanogan district, Washington.**

*Bull. Wash. agric. Exp. Stat.*, 369, 1939, pp. 55.

The Wenatchee-Okanogan and the Yakima districts are the two chief fruit producing areas of Washington and the former is one of the most important apple producing centres in the U.S.A. Information is given in this bulletin on the distribution throughout the district of different varieties of apples and other fruits. *Apples*, 75% of all fruit trees in district. There is a strong tendency to grow more Delicious, especially Red Delicious trees. *Pears*, 15% of all fruit trees in district. The number of pears relative to apples has increased steadily since 1920 and especially in areas where apple tree removals have been largest the pear population has increased. Bartlett was until recently the most favoured variety, but d'Anjou now forms the majority of recent plantings. *Apricots*, 6% of all fruit trees in district. Annual plantings since 1930 have decreased. *Peaches*, 3% of all fruit trees in district. There has been a small but constant increase in number of trees since 1925, and a tendency to prefer Hale to Elberta. *Cherries*, about 3% of all trees in district. Number of trees doubled between 1920 and 1935. Bing and Lambert varieties most popular, especially Bing of recent years. *Plums and prunes*, less than 1% of all fruit trees.

## Breeding.\*

767. SPINKS, G. T. 634.1/7-1.23

**Progress report on fruit breeding.***A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 47-53.*

This report contains short notes on the early results of Long Ashton crosses with a number of hard and soft fruits. In several cases, guarded but favourable reports have been received from growers and nurserymen to whom the crosses have been distributed. Such crosses are all designated by the word Cross at the end, thus apples—Gloucester Cross and Taunton Cross, pears—Bristol Cross, blackberries—Ashton Cross, etc.

768. NEW SOUTH WALES. 631.523

**Plant breeding in New South Wales. Twelfth year of progress 1937-38.***Sci. Bull. Dep. Agric. N.S.W., 66, 1939, pp. 61.*

Results of practical breeding work in New South Wales are reported here with various plants including cereals and forage crops, sugar cane, tobacco, tomatoes, peas, beans, lettuce, onions, beet, gourds, cucumber, sweet potatoes, *Brassica*, celery, rhubarb, apples, pears, plums and prunes, cherries, peaches, nectarines, almonds, apricots, grapes, citrus, passion fruit and strawberries.

769. MITCHURIN, I. V. 634.1/8-1.523

**Breeding results for 47 years. [Russian.]***Mitchurin's selected works, Voronezh Region Publishers, Voronezh, 1939, pp. 256-67, 12 roubles.*

Dr. Grell's method for adapting plants to severe climatic conditions by grafting them to hardy stocks proved to be useless. Mitchurin found that the only way to obtain hardy plants is to raise seedlings from seed obtained locally. In a locality where there are no plants of a certain species available for hybridization with fine European varieties, wild forms growing in countries with a similar climate should be used as parents. Mendel's laws and the cell chromosome theory are regarded as useless, in their present form, for the practical breeder, particularly when he has to deal with perennial plants. Soil conditions, rainfall, nutrition and many other factors exert a very strong influence on the development of characters inherited by the hybrids. Hence occasionally entirely new characters may be found in hybrid plants, e.g. the cross between Beurré Diel and Usuri pear gave Mitchurin's Winter Beurré, whose fruits are immune to bacterial and fungal rots. A great number of interspecific crosses were made. A few hybrids were also obtained from intergeneric crosses. These may have originated without the union of the parental gametes and as a result of the pollen effect on other parts of the female organs than the ovary, which in its turn may have led to parthenogenesis. Genes of the healthier and of the older plants and of the longer established species are more likely to be passed on to the progeny. A special method is described permitting hybridization of plants of different species or plants belonging to the same species, but only distantly related. It essentially consists of grafting scions, taken from several individuals of one species, to some of the branches of an approximately 10-year-old tree of the other species (future parent). The scions are exposed to root-stock influence until finally both species flower simultaneously. At this point cross pollination is made. No serious view should be taken if the cross pollination in the first year proves a failure, or the seed obtained in the year is non-viable, since this will not necessarily happen the next year. The same method can be applied to annuals, in which case certain alterations will be necessary. Over a hundred new hybrid varieties have been obtained in this way. They include hybrids from the crosses between apricot and plum, bird-cherry and cherry, Russian pear varieties and *P. salicifolia*, hybrids between different species of walnut, grape-vine, quinces, currant, lily, hybrids between pear and mountain ash, hybrids from crosses between distant apple species, hybrids from crosses between marrows and melons, water-melons and melons and many others. Practical hints are given to plant breeders on raising seedling hybrids from the seed. This section covers practically every point in seedling production and nursery

\* See also inside of back cover.

practice, and includes notes on the choice of parents for seed, on feeding the seedlings by injection and on the use of so-called mentor effects (see Abstract 794).

770. MITCHURIN, I. V. 634.1/7-1.523  
**A summary of the practical results of a breeder of new fruit tree varieties.**  
 [Russian.]  
*Mitchurin's selected works*, Voronezh Region Publishers, Voronezh, 1939, pp. 243-55,  
 12 roubles.

Breeding for hardiness and good quality fruit were Mitchurin's main object. As a result of his work carried on for many years in Central Russia, in the course of which he admits to have made several costly and time-wasting mistakes, Mitchurin reached essentially the following conclusions: 1. All hybrids obtained from crosses between two closely related sorts of the same species are less adaptable to new environment. For instance no hardy seedlings will be found among the seedlings obtained from the crosses between two non-hardy French apple or pear varieties grown in Russia. The results are even poorer when the seed of the non-hardy seedlings comes from the country of origin. 2. Most hybrids obtained from crosses between two different species or between two sorts of a single species but distant as regards their respective countries of origin are extremely capable of adapting themselves to new environmental conditions. Thus, a fine European variety, grown in Russia will be crossed successfully with a wild Russian pear species, or an old cultivated Russian variety. Among the seedlings resulting from such a cross there will be many individuals that are well able to adapt themselves to new environmental conditions, in this case to the severe cold in winter. Of the hardy seedlings obtained in this way only such should be selected and reared in the nursery as have the most characters of both the cultivated species and the particular European parent variety. In most instances, however, these characters are developed slowly and can only be distinguished when the seedlings attain a certain age. Some apple seedlings require a particularly long time for the full development of inherited characters. Less patience is required to ascertain the characters of pear, cherry, plum, apricot and bush fruit seedlings, and with these plants the propagation of varieties with desirable characters can be started sooner. 3. The ability of the parent plants to pass on their characters to the progeny varies depending above all on the individual properties of each individual plant. This ability is strongest in all true wild species: sorts of species developed long ago have a somewhat diminished ability to pass on their characters; recently developed sorts have a still more limited ability and, finally, the least capable of passing on parental characters and properties are hybrids from recent crosses between plants of two different species. The age and health of the parent plants are also extremely important in this respect. The technique used in cross pollination is described and brief notes are given on sowing and subsequent treatment of pome fruit and stone fruit seedlings. A method for improving the health and vigour of the seedlings, especially of plum seedlings, by feeding them with ammonia vapours through the foliage, consists of placing saucers filled with wet decomposing chicken manure between the rows of seedlings.

771. MITCHURIN, I. V. 631.521 : 632.3/7  
**Selection as a means of obtaining plants resistant to pests and diseases.\***  
 [Russian.]  
*Mitchurin's selected works*, Voronezh Region Publishers, Voronezh, 1939, pp. 279-82,  
 12 roubles.

Successful results were claimed by Mitchurin in breeding various fruits resistant to certain pests and diseases. *Currents.* Large-fruited black currants resistant to *Sphaerotheca mors uvæ* were obtained by crossing the English variety "Dukswing" (sic. Abst.) with *Ribes succirubrum*. *Pears.* Mitchurin's Winter Beurré resulting from the cross between wild Usuri pear (female parent) and Beurré Diel is the sole winter pear variety in Central and Northern Russia. In addition to such desirable characters as regular cropping, good quality fruit, long storage life (February), etc., the variety is valuable on account of non-susceptibility to bark scalding, tolerance of the flowers to morning frosts, and immunity of the foliage and fruits to fungi and insects.

After mechanical injury of the fruits penetration of fungi and rotting is prevented by the formation over the wound of a cork-like callus. It is noted, however, that no such protective tissue is formed when organic manure had been applied under the trees. *Grape-vines*. Several hardy, non-chlorotic varieties have been developed, which can be grown as far north as Mitchurinsk, where there is no real danger of *Phylloxera* and similar pests. *Tobacco*. Under Crimean conditions tobacco is very susceptible to *Orobanche* rots. In the search for hardy tobacco varieties producing good quality leaf in districts other than the Crimea, a cross was made between a small-leaved Sumatra variety and an early Bulgarian variety. As a result a variety was obtained that not only produced good tobacco leaf, but was also resistant to adverse climatic and soil conditions of Central Russia and the Urals. *Apricots*. It was found possible to select immune and hardy varieties which in the Mitchurin nursery did not require straw covering of the young shoots in winter. *Cherries*. An entirely new plant form was obtained from the cross between the Ideal cherry hybrid and the pure species of the Japanese cherry, *Prunus Maaki*. F.1 hybrids of this new form, which has been named *Cerapadus*, bear fruits containing large amounts of hydrocyanic acid as well as certain dyes required by the pharmaceutic and textile industry. The fruits of the F<sub>2</sub> hybrids are quite sweet. The foliage of the plants of both generations is toxic to insect pests.

772. MITCHURIN, I. V. 631.531.16 : 634/5  
**Seeds, seed life and seed storage before sowing.** [Russian.]  
*Mitchurin's selected works*, Voronezh Region Publishers, Voronezh, 1939,  
 pp. 300-7, 12 roubles.

1. Cucumbers, melons and certain varieties of vegetable marrows produce higher yields when they are raised from old seed, i.e. seed that has been stored for 4 to 5 years. 2. It is quite the opposite with most of the common fruit varieties. Long storage usually results in an appreciable fall in viability of the seed, in production of less vigorous plants, and, in the case of hybrid seed, in development of seedlings with undesirable characters. This condition remains unchanged even if the seed is stored under the optimum conditions or is stratified. 3. Late autumn sowing in the same year in which the seed is obtained gives better results than sowing in the following year. 4. Stratification is the best method of keeping the seed over the winter. [Practical directions are given.—ED.] 5. The seed of most fruits is affected by frost only if, (a) it is immature, (b) it has started to germinate, or (c) it swells as a result of excessive soil humidity after sowing. In each case moisture seems to be the determining factor. Brief notes are given on investigations outside Russia into the tolerance of dry seed to very low temperatures (−250°). The results of these experiments indicate that the condition of the protoplasm which is known as life cannot be broken by cold.

773. WANSCHER, J. H. 576.3 : 634.11 + 634.13  
**Contributions to the cytology and life history of apple and pear.**

Reprinted from *Yearb. R. vet. agric. Coll. Copenhagen* 1939, pp. 21-70, bibl. 53.

A grant from the Carlsberg Foundation enabled the author to work out the chromosome numbers and also investigate the life history of a number of apple and pear varieties grown commercially in Denmark. The results of his studies are given here. He correlates his results with those obtained by other workers and in addition adds another 78 new varieties to the number of pear and apple varieties whose chromosome counts are now determined. He illustrates with drawings the embryonic development of a diploid, i.e. Cox's Orange Pippin and of a triploid, Bramley's Seedling. Finally he describes the endosperm formation in certain apple varieties.

774. GARDNER, V. R. 634.11 : 575.252  
**Studies in the nature of the pomological variety. 1. A hetero-chimeric apple sport and its vegetative progeny.**

*Tech. Bull. Mich. agric. Exp. Stat.* 161, 1938, pp. 14, bibl. 33.

In a Michigan apple orchard consisting of some 10,000 trees of four standard varieties (Wagener, McIntosh, Grimes and Northern Spy) a single tree was discovered that had the growth habits

\* The original paper was published in the "Na zashchitu socialisticheskovo urozhaya", No. 12, 1931.

of Northern Spy while its fruit did not bear resemblance to that of any known variety. A detailed description and classification is presented of the fruits from the "Graham" tree (named after the orchard owner) and also of those of its vegetative progeny.

*Propagation.*

775. GARNER, R. J., AND HAMMOND, D. H. 631.541.5 : 634.11  
**Studies in nursery technique. Shield-budding treatment of inserted buds with petroleum jelly.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 115-7, bibl. 4.*

Staniland and Umpleby had already shown that the treatment of newly inserted buds with petroleum jelly prevented damage by the red bud borer (*Thomasiniana oculiperda* Rubs.). The present authors working with buds of Cox's Orange Pippin apple on E.M. II rootstock in May, 1938, and on E.M. IX rootstock in August, 1938, some 1,600 buds being inserted, showed that a definite increase in bud take followed treatment even when no question of insect damage arises. They recommend a trial of this simple and cheap precaution.

776. PEARSE, H. L. 634.1/2-1.541.11-1.535 : 577.15.04  
**Experiments with growth-controlling substances. II.\* Response of fruit tree cuttings to treatment with synthetic root-forming substances.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 157-66, bibl. 3.*

Treatment was similar to that worked out by Hitchcock and Zimmerman. The cuttings were freshly prepared and after having a few of the lower leaves removed the basal ends were immersed to about 1 inch in the test solutions. These were within the range 5 to 80 p.p.m. and one immersion of 24 hours was used, the treatment being given in a cool room. Root formation was accelerated and increased in softwood cuttings of several varieties of pear, quince, apple, plum and cherry by treatment with indolyl-butyric acid and  $\alpha$ -naphthalene acetic acid. In general the former caused the production of more fibrous root system than the latter. The physiological condition of the cuttings was most important. Thus some rooted well from cuttings taken when the shoots were in active growth, some when the shoots were in active growth or had ceased to grow, others only responded when taken after the cessation of growth, while only very few gave a better response from young cuttings taken in active growth than from older cuttings taken after cessation of growth, e.g. quince A and quince C. Subsequent treatment with vitamin B<sub>1</sub> did not increase the number of cuttings which rooted, but cuttings so treated which did root grew on more vigorously after removal from the frames. No marked stimulation was obtained of hardwood cuttings. Further work is in progress to discover a suitable technique for rooting these.

777. FILEWICZ, W. 631.541 : 634.11-2.111  
 Nowe metody w sadach i szkółkach. (**Reinvigoration of orchard trees by bridge grafting and inarching.**) [English summary 8 pp.]

Reprinted in 1939 from *Ann. Sci. hort.* 1938, 5 : 35-140, bibl. 30.

In his introduction the Polish Minister of Education pays tribute to the author's enterprise and success in his Sinoleka experimental orchards and expresses the hope that the article will promote a profitable exchange of ideas on the subject discussed. It is certain that all who are interested in the problems of resuscitating apple trees badly damaged by canker or sunscald will find Dr. Filewicz's account of his experiments at Sinoleka of the greatest value. Excellent illustrations together with the long English summary show the great possibilities afforded by the methods suggested. After reviewing the literature the author shows how Sinoleka winter conditions do not allow of the successful growth of such choice dessert varieties as Cox's Orange Pippin, Winter Gold Pearmain or Landsberger Reinette without certain measures being taken

\* For I see *J. Pomol.*, 1937, 15 : 248. *H.A.*, 7 : 827.

to ensure their survival of such winter frosts as are likely to occur every few years. The methods successfully used have been bridge-grafting over the injured portion with hardy graft wood, inarching suckers from the hardy rootstocks to points above injury and planting a hardy seedling close to the dead or dying trunk and inarching it across the dead part to the healthy tissue above. Very satisfactory results have been achieved and are here described. While not always conferring complete immunity to frost damage they have at least generally ensured that even when damaged after a short pause the tree has regained its vigour and has not died as in the case of untreated trees. Filewicz's present method, adopted successfully since 1932, is to double-graft any new trees planted on to a resistant variety, Antonowka. The trunk is first formed with Antonowka as scion. It is then grafted with the desired tender variety, but two or three branches of Antonowka are left below the place of grafting. These branches are said to increase the resistance of the tender variety without weakening its growth. Sometimes such branches will be bridge-grafted over the crotch into the tender variety above. An alternative method is to use Antonowka or other hardy variety to form both trunk and crown and then topwork, leaving one or two branches of the hardy variety.

778. PIERI, A. 634.13-1.541.11  
 Il sovrainnesto del pero William. (**Topworking the Williams pear tree.**)  
*Note Fruttic.*, 1938, 16 : 130-5.

The author has found that the extreme variability in growth of the Williams pear worked on quince is a great drawback. He is uncertain of the reason since lack of uniformity is apparent even when scion wood is taken from the same tree. Moreover, if the cause lay in the use of seedling quince rootstocks, one would expect a similar lack of growth uniformity in other varieties. This is, however, absent. He therefore recommends those who suffer from this variability to topwork with such varieties as Passe Crassane, Louise Bonne, Vicar of Winkfield or Beurre Hardy.

779. WRÓBLEWSKI, A. 634.1/2-1.541.11  
 Program badań nad podkładkami wegetatywnymi drzew owocowych w Ogrodach Kórnickich. (**Programme of investigations on fruit tree rootstocks in the Kórnik Gardens.**) [German summary 4 pp.]  
*Ann. Sci. hort.*, 1938, 5 : 177-91, bibl. 49.

The very severe winter of 1936/7 had at least the useful result of showing up certain types of varieties of fruit trees as frost resistant and it is partly on the types so discovered and partly on resistant types from abroad that the present investigations in the Kórnik Gardens are based. *Apples.* 51 types of seedling *Malus baccata* are under trial and many of them show good rooting in the stool bed. Since, however, most scion varieties have considerable difficulty in forming good unions with *M. baccata*, the attempt is being made among frost-hardy scion varieties to find some which will make good unions and act as intermediate rootstocks. Out of some 10,000 2-year budded *Malus silvestris* seedlings 65% perished in the winter of 1936/37. Of the remainder, 87 individuals which showed little or no frost damage and have proved to be easily rooted are now under trial. The third species, *M. prunifolia*, is found in Siberia to be much truer to type than with *M. baccata* or *M. silvestris*. It has, moreover, shown itself very frost resistant in Russia, Canada and the U.S.A. Some 49 very interesting types have now been selected and are undergoing frost propagation tests.

*Plums.* Owing to the frequency of incompatibility with *P. insititia* attention is now being directed to *P. cerasifera divaricata*. Of the latter 32 types which remained undamaged through the 1936/37 winter were selected. Woody cuttings of these were treated with Hormone A and planted out. Some responded with both root and shoot growth. Trials on *P. insititia* have not yet begun.

*Pears.* All *Pyrus communis* seedlings are badly affected by *Entomosporium Mespili* and the spraying which is thereby necessitated damages the leaves and so hinders successful budding. Other species immune to this fungus have, therefore, been introduced from the Far East and the Caucasus. Some of these are fairly frost-resistant such as *Pyrus ovoidea*, *P. serotina*, and

*P. communis caucasica* or *P. ussuriensis*. *P. communis caucasica* of the Asiatic varieties and *P. owoidea* and *P. serotina* from Korea showed no frost damage in the Polish winter of 1936/37, while *P. Calleryana*, *P. Bretschneideri*, *P. betulaefolia* and *P. ussuriensis* went down under the same conditions.

*Cherries*. Investigations are in progress with *Prunus Mahaleb* which is fairly frost resistant and an attempt is being made to find easily propagated types of *P. avium* which are entirely frost resistant. Of the Malling types tested quinces A and C were killed completely by the frost; under 10% of the apple types I, II and IX were killed, while XIII, XVI were quite unharmed. The two last and XII are to be further tested under even severer winter conditions in the North East of Poland. It is suggested that possibly they might provide a uniform source of material for intermediate stocks referred to above. For dwarf pears *Cotoneaster*, *Crataegus sanguinea* and *Sorbus Aria* and *S. latifolia* are being investigated.

780. ANON. 634.11-1.541.11  
*Aeblesorter og Grundstammer. (Apple varieties and rootstocks.)*  
*Tidssk. Planteavl, 1938, 43 : 548-51.*

Tabulated results are given of the comparative growth and yield of 12 apple varieties including *Belle de Boskoop*, *Bellefleur de France*, *Boiken*, *Bismarck*, *Cox's Orange Pippin* and *Blenheim* on seedling, V and IX rootstocks at Blangsted between 1922-1937. As regards cropping trees on IX were well ahead up to the end of 1929, but later the total of crops from all varieties on seedlings outstripped those on IX. Trees on V were not satisfactory either in growth or yield. It is thought that the figures of spread given for the different varieties on the three stocks may be useful for deciding planting distances.

781. SPINKS, G. T. 634.11-1.541.11  
*Apple rootstock investigations. Progress report.*  
*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 40-6.*

Trials at Long Ashton and elsewhere have been in progress since 1926 on 15 clonal apple rootstocks originally got from selected seedlings by layering and worked with *Worcester Pearmain*, *James Grieve*, *Lane's Prince Albert*, *Bramley's Seedling*, *Newton Wonder*, *Blenheim Orange* and *Kingston Black*. The trials consist of standard and bush trees under grass and clean cultivated. Two of the stocks have shown incompatibility with certain scions. Three have promise of future value but require comparative trial against II and XII. They are designated as G.8, E.7 and E.8. G.8 sometimes produces a large tree which starts cropping earlier than trees on XII. Trees on E.7 crop well and are fairly vigorous, while E.8 appears to induce heavy cropping combined with semi-dwarfingness.

782. BERRY, W. E. 634.11-1.541.11  
*A note on the relation of absorption to vigour in apple stocks.*  
*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 63-5.*

The author gives a short account of a preliminary enquiry into the extent to which vigour in a rootstock can be correlated with its capacity for absorbing mineral solutes. The experimental material consisted of four stocks each of apple stocks IX, II and XIII. These were removed from the stool beds and planted in 12-inch pots in sand after removing all roots and weighing. The sand was kept moist with rain water until the buds were about to break, when a complete nutrient solution was applied on alternate days. On the other days the cultures received 500 c.c. of a 0.001 M potassium bromide solution. This was used as an indicator of the amount of absorption. Later it was applied every day at a strength of 0.005 M. The trees were harvested at the beginning of August and each was divided into young and old leaves, bark and wood of upper, middle and lower stem and shoots, and roots. The fresh and dry weights of these fractions were determined and the dry material analysed for bromide. Calculated on percentage increase in dry weight the order of stocks corresponded with that of accepted vigour namely XIII, II, IX. These figures were significant. Figures of the total bromide absorbed by each tree were in the same order, but were not significant as between XIII and II

and II and IX. The small number of trees is probably the cause of this lack of precision. It is worthy of note that absorption is related to increase in dry weight rather than to absolute size of tree.

783. VYVYAN, M. C. 634.11-1.541.11  
**Note on the effect of the variety of stock used to provide the intermediate stem piece in some double-worked apple trees.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 148-56, bibl. 4.*

Apple trees were double-worked in a single season by the insertion of scion buds high up on stems in July, and the grafting of these stems on to rootstocks the following winter. The scion was Stirling Castle in all trees and the rootstocks No. XII. The intermediate was No. II in one set of trees and No. XII in the other. The rootstock included a piece of stem as well as roots. After ten years there was no difference in cross section of scion in the two sets of trees, but that of the intermediate was less in the II/XII trees. There was also a swelling above the upper union in these trees, and none in the XII/XII trees. There was no significant difference in wood growth, final weight, or rate of growth between the two sets of trees, or in the relative weights of stem and root or trunk and branches. Trees with a No. II intermediate produced progressively more fruit buds than those with No. XII intermediate and by 1936 the number per tree and per metre wood had become significantly greater. [Author's summary.]

784. BEAKBANE, A. B., AND THOMPSON, E. C. 634.11-1.541.11 : 581.144.2  
**Anatomical studies of stems and roots of hardy fruit trees. II. The internal structure of the roots of some vigorous and some dwarfing apple rootstocks, and the correlation of structure with vigour.**

*J. Pomol., 1939, 17 : 141-9, bibl. 6.*

Transverse sections were made of the roots of eighty-six four-year-old apple trees on Nos. VII and IX and on eight new clonal rootstocks, worked with Lane's Prince Albert. The new rootstocks were obtained by crossing the two dwarfing rootstocks Nos. VIII and IX. A striking correlation was found between the relative area of bark to wood, as seen in transverse section and the vigour of the scion. Transverse sections of the roots were examined by means of a projection apparatus. Direct negatives were made on bromide paper, showing the structure of the wood of eight new rootstocks and of Malling rootstocks Nos. VII, VIII and IX. The photo-micrographs so obtained were then cut into four elements of the wood and weighed in the following groups : (1) fibres, (2) parenchyma, (3) vessels and (4) rays. (i) The percentage areas of fibres, vessels, rays and, to a less extent, of parenchyma estimated from these photographic prints, was found to bear a marked connexion with the vigour of the scion, the clearest connexion with vigour being in the proportion of wood ray tissue. (ii) The four vigorous rootstocks Nos. VII, 45, 125 and 128 were found to have an almost equal amount of living and dead tissue in the wood, whereas the six more dwarfing rootstocks Nos. IX, 90, 9, 108, 29 and 99 showed from twice to three times as much living as dead tissue. (iii) Counts of fibres and vessels in the wood revealed a clear break between the four vigorous and the six dwarfing rootstocks, the former having a larger number of vessels and nearly twice as many xylem fibres as the latter. (iv) No definite connection was found between the size of the wood elements and the vigour of the scion, but there was a tendency for the more vigorous rootstocks to possess larger vessels than the dwarfing rootstocks. [Authors' summary.]

785. COOPER, T. P. 634.11-1.541.11 : 581.14  
**The first season's growth of apple grafts as affected by type of stock and part of scion.**

*Circ. Ky agric. Exp. Stat., 49, 1938, pp. 11, bibl. 12.*

In February, 1936, 767 whip grafts were made from 34 varieties of apple to test whole-root versus piece-root grafts and the top versus the lower half of scion wood. The scion wood, which was fairly uniform in length and diameter, was cut in half and grafted on branched whole roots and on straight unbranched piece-roots of French crab seedlings. The scions were

7-8 inches long and the stocks 4-5 inches. There was no significant difference in the height or diameter measurements of the nursery trees produced, but there was considerably less mortality when branched whole-root stocks were used than with piece-root stocks. Equally good results were achieved by the use of the top as by the use of the bottom half of the scion. Mortality of grafts varied somewhat with scion varieties irrespective of stock. A high degree of correlation was found between height and diameter of trees.

786. EVREINOFF, V. A. 634.11-1.541.11  
*Malus prunifolia* Borkh. comme espèce fruitière et porte-greffe. (*Malus prunifolia* as a fruit tree and rootstock.)  
*Rev. hort. Paris*, 1939, 26 : 455-6.

*Malus prunifolia* Borkh. is described and illustrated (col. plate). This apple is used as a stock in the United States, Canada and Russia, the method of propagation being by seed. The seedling plants produce a mass of fibrous roots rendering transplanting easy. They grow strongly and are particularly useful stocks for standard trees. They are easy to graft and are compatible with most varieties. The parent trees are very fertile and produce seed in unlimited quantities. The stock induces in the scion its own habit of late flowering. It is much used for hybridizing and is parent of some useful varieties.

787. TUKEY, H. B., AND BRASE, K. D. 634.11-1.541.11  
The behavior of Malling apple rootstocks in the nursery.  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 113-5, bibl. 6.

The information given is based on observations over 11 years involving the propagation of over 100,000 rooted plants and 20,000 budded trees. A brief note is given of the behaviour of each of the 16 Malling stocks except No. XIV.

788. LINCOLN, F. B. 634.11-1.541.11-2.1  
Some apple tree stock relationships seen in New England after 1938 hurricane.  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 102-9.

The uprooting of thousands of apple trees in New England by a hurricane presented an opportunity to relate the findings on root firmness to several stock, scion hypotheses. The stocks were French crab seedlings. The hypotheses considered were, (a) the crown of a tree has a dominating influence on the properties and characteristics of stock roots; (b) the trunk of the tree is the part which gives specific properties and characters to the root stocks; (c) erect growing trees have deep-penetrating root systems. It is assumed with seedling stocks—ED. that the roots were similar at time of propagating. The various types of uprooting and breakages are discussed and illustrated with some of the 400 photographs so far taken during the study. Conclusions arrived at are (a) the uprooting of trees was very definitely related to the scion varieties and there seems nothing contrary to the premise that the crown has a dominating influence on the stock roots; (b) that the theory that the trunk of the tree is the part which gives specific properties to the stock root was not supported, for the unstable MacIntosh top worked on other trees in themselves stable to the wind caused these trees to become unstable; (c) no definite conclusions could be reached; two erect-growing deep-rooting varieties stood firm, two others of similar habit fell. The low-headed R.I. Greening was very resistant.

789. SOUTHWICK, L., AND SHAW, J. K. 634.11-1.541.11  
Further notes on the Malling clonal stocks in relation to McIntosh and Wealthy.  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 133-7, bibl. 9.

In Massachusetts Malling stocks XII and XVI have been outstanding in promoting vegetative growth in McIntosh and Wealthy. On XVI both varieties outyielded other combinations. Malling XV delays precocity in scions worked on it. Other combinations were arranged variously and seedling rooted trees assumed approximately a mean position in all computations of size

and yield. Malling IV and I were the best of the semi-dwarfing. The very dwarfing stocks performed unsatisfactorily. Variability studies show that very little benefit can be expected from the use of clonal rooted trees in establishing and maintaining uniformity in Massachusetts.

790. TYDEMAN, H. M. 634.13-1.541.11-1.531  
**Pear rootstocks from seed. I. Experiments on methods of germinating pear seeds.**  
*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 103-9.*  
 The difficulty of germinating pear seed has led to investigations in S. Africa and at East Malling into the optimum conditions for ensuring satisfactory germination. The effect of the following methods of keeping the seed prior to germination were tested:—(1) Seeds taken from fruit in autumn and sown in shallow boxes which were placed in (a) a warm greenhouse, (b) an unheated greenhouse, or (c) the open ground. (2) Fruits kept in a clamp out of doors from picking till mid-February and seeds then sown as above a, b and c. (3) Seeds taken from ripe fruits in late autumn, stored in paper bags in warm room till 18 February and then sown as in a, b and c. (4) Seeds overwintered from November in a warm room, in an earth clamp or in a cold chamber at 0° C. and sown in mid-June. (5) Seeds stored out of fruits in a warm room, or in fruits in an earth clamp, or in fruits in a cold chamber, and sown at intervals from mid-October to mid-July. The best germination results were obtained when the seeds were given a single short cold period, either while still in the fruit or in the seed boxes. When stored within the fruit the seeds should be extracted and sown in early spring. No evidence was shown of large or consistent differences in the natural viability of the seed from different selections.

791. TYDEMAN, H. M. 634.13-1.541.11  
**Pear rootstocks from seed. II. Studies on the variation in seedling pear trees.**  
*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 110-4, bibl. 4.*  
 Comparisons are made between the habit of growth and the shoot and leaf characters of young seedlings raised from open-pollinated seed of East Malling selected Free Pear A1 and those of seedlings raised at East Malling from seed collected from wild pears growing in the Caucasus. Variability was greatest in the former, probably owing to the greater opportunities for cross-fertilization in trees grown under cultivated conditions.

792. TRUET, H. 634.23-1.541.11  
**Contribution à l'étude des porte-greffes en Algérie. III. Porte-greffes du cerisier. (Rootstocks for cherry in Algeria.)**  
*Rev. Hort. Agric. Afr. N., 1938, 42 : 147-8.*  
*Cerasus Avium.* An excellent stock for cherries under suitable soil conditions. Deep, cool, light, non-calcareous, well-drained soils, are preferred. On various combinations of sand and clay it gives great longevity to its scions. A simple test to determine whether cherry rootstocks are mazzard or mahaleb is to taste the bark of the roots; mazzard is distinctly bitter, mahaleb is not, but it has a stronger smell. To bring out these differences it is only necessary to make a slight incision in the roots. *Cerasus Mahaleb* Mill. Mahaleb is recommended for dry and calcareous or silicious alluvial soils. It is quite unsuitable for moist soils or on land with a high water table. With some scion varieties the scion tends to overgrow the stock. In all cases mahaleb reduces vigour, often causes dwarfing, retards maturity by 5 to 10 days according to scion variety and improves size, sweetness and flavour. If height is required, a vigorous bigarreau should be used as an intermediate stock.

793. MITCHURIN, I. V. 634.23-1.541.11  
**The influence of cherry seedling stocks upon the ripening date, yielding capacity and size of fruits.** [Russian.]  
*Mitchurin's selected works*, Voronezh Region Publishers, Voronezh, 1939, pp. 127-9, 12 roubles.  
 In these papers reprinted from *Vestnik sadovodstva, plodovodstva i ogorodnichestva*, 1888, No. 9, p. 402, Mitchurin was already noting that stocks not only affect the vigour and the degree of hardiness of cherry trees, but have also a strong influence on the ripening date, yielding capacity and size of fruit.

794. MITCHURIN, I. V. 634.1/2-1.541.11  
**The use of "mentors" in raising hybrid seedlings and examples of definite changes induced in fruit tree varieties by various external factors.** [Russian.]  
*Mitchurin's selected works*, Voronezh Region Publishers, Voronezh, 1939, pp. 209-23, 12 roubles.  
 An account is given of the remarkable way in which the character of young hybrids can be affected by artificial methods. Healthy six- to seven-year-old hybrid seedlings can be induced to crop appreciably earlier by grafting their lower branches with a few scions taken from an older tree of a high yielding variety. The scions of this mentor variety should be removed after the first crop, when it is not wished to affect the character of the fruit of the young hybrid seedling. If, on the other hand, it appears desirable to add certain characters of the mentor's fruits to those of the hybrid, the scions of the mentor may be left on the tree for two or three more years. By that time the new characters will have become fully established in the hybrid seedling. Control experiments showed that the use of mentors is always successful in inducing earlier cropping of hybrid seedlings. In several instances it was possible to improve storage quality and colour of the fruits and to increase the amount of sugars in the fruit flesh with the aid of mentors applied to the hybrid seedlings as late as one year after their first crop. In two other instances hardiness was improved. However, the use of mentors was not always successful, e.g. in one particular case it did not help to improve the appearance of the fruit of a certain apple hybrid, or to reduce the drop of fruits which were of a particularly fine flavour, but extremely loosely attached to the stem. Among different mentor effects the following are noted : 1. Early cropping was induced in a young pear hybrid seedling but delay in removing the mentor scions resulted in loss of the character of early ripening. 2. Working old pear trees or old established pear varieties with scions taken from young trees of a new hybrid variety was useless. 3. Transferring the pollen from old established varieties and older trees to the flowers of an apple hybrid seedling had a marked influence on the fruit characters, before the seedling's own characters were fixed (five years after the first cropping year).

795. BALME, J. 587.34 : 634.1/7  
 Quelques notes sur un arbre fruitier mexicain le *Crataegus mexicana* M. and S.  
**(Notes on the Mexican fruit tree *Crataegus mexicana*.)**  
*Rev. Hort. Agric. Afr. N.*, 1939, 43 : 65-7.  
*Crataegus mexicana* M. and S. is suggested as worth cultivating for its fruits elsewhere than in Mexico where it is much esteemed. There are several varieties differing mainly in the size and shape of fruit and also in time of maturity. In Mexico fruit is obtainable from one variety or another, aided by differences in altitude, for 6 months of the year. Though at home on shallow stony soils, it is at its best in deep soils, where it grows very rapidly and bears heavily. It forms, at any rate in Mexico, a very successful stock for apple, pear and quince and is much used. The fruit has in addition to its dessert and preserving qualities a medicinal value, while the very durable wood is employed in making tool handles.

## Root growth.

796. ROGERS, W. S. 634.11-1.541.11 : 581.144.2  
**Root studies. VIII. Apple root growth in relation to rootstock, soil, seasonal and climatic factors.**  
*J. Pomol.*, 1939, 17 : 99-130, bibl. 20.  
 The studies described were made on 4 14-year-old Lane's Prince Albert apple on rootstocks Nos. I, IX and XVI for 4 consecutive years at East Malling. The soil was a deep, sandy loam. The studies were made by means of observation trenches provided with glass windows supported against the soil profile and normally protected from light. During active growth periods the growth rate ranged from 0-9.4 mm., but 3 mm. per day was common. Suberization of the root occurred at the age of one week to one month. The cortex then shrank and rotted, leaving the central cylinder loose in the hole. The smaller roots usually died and disappeared while the larger ones persisted. Active growth began first in the upper soil layers when the soil temperatures reached 45° F.; there was only slight growth in winter with soil temperatures below 45° F. and that was in the lower soil layers. Under warm soil conditions the presence of moisture accelerated growth; its reduction acted as a check to root growth long before the wilting range was reached. Root growth started before shoot growth and continued after it had ceased; the peak was reached in June and July, though later two smaller peaks might be expected. Greatest root concentration was at a depth of 5-20 in. Comparisons between the root systems of the different stocks indicated that No. XVI, the most vigorous stock, reached its peak more quickly, had a deeper absorbing root distribution and a slightly slower suberization rate, and had more rather than longer absorbing roots than the others. From the observations made it is considered that quick acting fertilizers will be most effective in the early spring or early autumn and that slower acting manures can be used all the year round. Deep cultivation should be confined to the winter months.

797. ROGERS, W. S. 634.11 : 581.144.2 : 612.014.44  
**Root studies. IX. The effect of light on growing apple roots: a trial with root observation boxes.**  
*J. Pomol.*, 1939, 17 : 131-40, bibl. 3.  
 From tests described it is concluded that the exposure to light of roots in observation boxes and trenches during the short period necessary for the daily recording had no significant effect on the results. Continuous exposure severely checked growth and hastened suberization. A small type of observation box mounted on trestles is described and illustrated. It proved very useful for observation of certain treatments on the roots of small plants for one or two years.

798. SUSA, T. 634.11 : 581.144.2  
**Apple root systems under different cultural systems.**  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939*, 36 : 150-2.  
 Two cultural methods were tried on various apples of various sizes on *Malus Sieboldii* at the Aomori-Ken apple experiment station, Japan; (a) broadcast manure with cultivation, and (b) ring manure with no cultivation. Under (a) the root increase was consistent and regular, under (b) the distribution was uneven and the numbers of small roots increased somewhat centrifugally. There was a far greater number of roots under (a), showing the smaller absorbing area resulting from (b). The yield under (a) was 20% greater than under (b), even when (b) received double the quantity of manure. [The distance of the ring manuring from the trunk is not stated.—ED.] Photographs of root excavations show the very striking differences resulting from the two systems.

799. COWART, E. F. 634.25 : 581.144.2

**Root distribution and root and top growth of young peach trees.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 145-9, bibl. 11.*

Under the soil and climatic conditions at the Georgia Experiment Station roots of 1-year-old peach trees (June-budded Elberta) penetrate to 3 feet and spread to 6 feet; 2-year-old trees penetrate to 4½ feet with a spread of 12 feet. The greatest weight of roots was always at 6-12 inches depth and within a foot of the trunk. The greatest concentration of small roots was in the 12-18 inch level with 1 year trees. They were equally distributed to a depth of 18 inches with 2-year-old trees. These studies show the areas in which fertilizers may be most efficiently placed.

*Pollination.*

800. RUDLOFF, C. F., AND HERBST, W. 634.13 : 581.145

**Zur Physiologie des Fruchtens bei den Obstgehölzen.\* II. Vorgänge der Fruchtbildung bei einigen Birnensorten. (The physiology of fruiting in fruit trees.**

**II. The process of fruit formation in certain pear varieties.)**

*Gartenbauwiss., 1939, 13 : 235-85, bibl. 11.*

Flower shedding and fruit drop are accounted for by a combination of genetic and environmental factors, particularly nutrition. Pear trees can be divided into 3 groups, namely, 1, those subject to a relatively late shedding of flowers and inflorescences; 2, a group subject to early extensive shedding of flowers and inflorescences, and 3, an irregular group. A relationship has been determined between the groups and the time of flowering. Fundamentally, each flower is capable of setting fruit. Certain flower groups and to a lesser extent certain individual flowers are in a position to be the first to fruit. The varietal factor appears to have a certain importance. There is a correlation between the succession in flowering and the fruiting tendency of the flowers. Certain morphological characters of the inflorescences are closely associated with the fruiting tendency of the flowers in their respective positions. As fruit size increases the number of fruits yielded per cluster decreases. In some varieties the comparative weight of fruits fell according to whether the fruits developed from the base or the top of the inflorescence. Certain conclusions were reached on the absolute and relative fruiting capacity of pear trees. Growth hormones appear to be of major importance for the formation of inflorescences, and the chief nutrients for fruit formation.

801. HERBST, W., AND RUDLOFF, C. F. 634.13 : 581.145

**Zur Physiologie des Fruchtens bei den Obstgehölzen. III. Phänologisch-phanometrische Untersuchungen der Blühphase von Birnen. (The physiology of fruiting in fruit trees. III. Phenologic-phenometric investigations on the flowering phase of pears.)**

*Gartenbauwiss., 1939, 13 : 286-317, bibl. 3.*

An account is here given of a quantitative and qualitative study of varietal factors which influence the flowering process of pears. A special phenometric method had to be developed for these investigations. It is noted that a parallel publication will deal with the influence of environmental factors.

802. STAPEL, C. 581.162.3 : 634.1/2

**Undersøgelse over de ved Frugttræernes Bestovning medvirkende Insekter.  
(Investigations of insects which pollinate fruit trees.)** [English summary 2 pp.]

*Tidsskr. Planteavl, 1939, 43 : 743-800, bibl. 56.*

An account is given of observations on pollinating insects in orchards near Copenhagen in the years 1935-1937. Honey bees provided 48% of the pollinating insect visitors, *Andrena* 25%,

\* See also *H.A.*, 9 : 425 and 801.

*Syrphides* 12%, other flies 10%, *Bombus* 4% and other bees only 1%. The actual species found are named. *Apis* generally visited 8-16 flowers a minute (i.e. 8 apple blossoms to 16 plum blossoms), *Bombus* 15-22 and *Andrena* females 4-6 flowers a minute. The best flies were *Eristalis* spp. Insect activity was very low at temperatures below 13-14° C. (56° F.). Flowering times of the different fruit species are shown, maximum temperatures are given and a rough estimate is made of insect visits. It is considered that 200-400 honey bees per hectare and the other insects mentioned above will suffice to ensure a good crop of apples.

803. FLECKINGER, J. 634.11 : 581.162.3  
 Caryologie, qualité germinative du pollen chez nos variétées de pommiers.  
 (Caryology and germination quality of pollen in French apple varieties.)  
*Ann. Épiphyt. Phytogén.*, 1937, 3 : 481-506, bibl. 25.

The author has tested and here sets out in detail the results of his tests on the germination in sugar solution of the pollen of a large number (about 170) French apple varieties in the years 1935 and 1936. He discusses the correlation of these figures with those for the chromosome complements, where known.

804. KING, J. R., AND HESSE, C. O. 634.1/7 : 581.162.3  
 Pollen longevity studies with deciduous fruits.  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939*, 36 : 310-3, bibl. 16.

The paper constitutes a progress report of investigations at the University of California on the interrelation of temperature and humidity to the pollen longevity of deciduous fruits. So far the results stress the importance of favourable humidity. 25% relative humidity consistently enhanced the storage life of pollens even at limiting temperatures. A favourable temperature for any particular pollen is, however, also necessary to secure maximum germination after a long storage period. 36° F. and 25% relative humidity seem most favourable. A 2% agar medium containing 15% sucrose was found to enhance germination and to give more consistent results than the 15% sucrose solution commonly used by many workers.

805. EINSET, O. 634.22 : 581.162.3  
 Experiments in plum pollination.  
*Gartenbauwiss.*, 1939, 13 : 318-26.

Results are presented here of experiments conducted for seven years at the New York Agricultural Experiment Station in which the degree of cross incompatibility was studied between *Prunus salicina* and *P. domestica* and *P. insititia* plums, as well as the degree of the self fertility in plums in general.

806. HOOPER, C. H. 581.162.3 : 638.12  
 Hive bees in relation to commercial fruit production.  
*J. S.-E. agric. Coll. Wye*, 1939, No. 44, pp. 103-8, bibl. 35.

After a note on the habits of the helpful humble bee the author considers the hive bee in the orchard and how to ensure that its work there is successful. First the hive needs to be very strong numerically, ready for the time when the blossom opens. It should be left in the autumn with plenty of honey, with a large stock and preferably a young queen. Feeding may be necessary in early spring. An ideal distribution of hives would be 200 ft. apart, but often for convenience six hives are set together. An account is given of the methods adopted by Mr. R. Hodgkinson, one of the largest honey producers in the south of England. For fruit pollination on a large scale he imports skeps of Dutch bees. These are put in the plantations just before plum and pear blossoming and removed when apple and cherry blossoming is over.

*Growth and nutrition.*

807. KELLEY, V. W. 634.1/2 : 581.45 : 632.112  
**The relation of leaf form to transpiration rate and drouth resistance in some deciduous fruits.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 210-5, bibl. 14.*

A study of 21 species of deciduous fruits classed as mesophytes showed leaf variations and adaptations usually attributed to xerophytes. Narrowness of leaf and low rate of transpiration per unit area were usually combined in the same species.

808. TUKEY, H. B., AND BRASE, K. D. 634.11 : 581.14 : 631.4  
**Studies of top and root growth of young apple trees in soil and peat-soil mixtures of varying moisture contents.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 18-27, bibl. 7.*

The data were obtained from 14 2-year-old McIntosh apples on Malling I rootstocks grown in wooden boxes, each containing 2 cubic feet of the selected rooting media, which were either soil or 50% soil and 50% peat moss. The boxes were kept under dry, wet and medium (control) moisture conditions. The incorporation of granular peat moss with the soil gave improved aeration, higher oxygen content and lower carbon dioxide content, particularly as compared with soil with excess moisture, and increased root development and spread irrespective of excess, medium or below medium moisture conditions. With excessive early season moisture top and root growth increased greatly, with medium early season moisture both increased and with below medium early season moisture root growth only increased. With excessive mid season moisture the relative increase in top growth was reduced. With medium and below medium mid season moisture the relative increase in top growth from peat moss was increased. Among the factors which are involved in the benefit from peat moss are better contact of roots with soil moisture immediately after planting, improved aeration, easier penetration of rain water with a reduced run off of surface water, and easier penetration by the roots.

809. ANON. 634.1-1.541.11  
 Stammehøjdens Indflydelse paa Udbytte af Aebletraeer 1927-37. (**The influence of height of trunk on yield in apple trees.**)  
*Tidsskr. Planteavl, 1938, 43 : 552-4.*

Both Codlin Springgrove and Lane's Prince Albert apple trees worked in 1934 at Blangsted on selected crab seedlings gave a greater yield in their first 11 years of cropping on 0.5 m. trunks than on 1.0 m. trunks. The opportunity was also taken of comparing crops from bush trees of these varieties on their own roots to those from bush trees on seedling roots. Codlin Springgrove gave the best yield on seedlings, Lane's Prince Albert on its own roots.

810. MITCHURIN, I. V. 634.1/8-1.541.11  
**Explanation of the "mentor" effects.** [Russian.]  
*Mitchurin's selected works, Voronezh Region Publishers, Voronezh, 1939,*  
 pp. 273-8, 12 roubles.

The nearest definition of what Mitchurin calls "mentor" would be "factors bringing about important changes in the behaviour of a plant". These factors may be stock or scion influence or, for instance, the effect of different pollen on very young hybrid trees. Mentor effects are very strong in young hybrids, whereas old varieties are least susceptible to such influence. Among other examples quoted are the following:—1. Large fruited, white, early ripening 4-year-old hybrid cherry (Knyazhna Severa) was grafted to seedlings of red common cherry. Three years after the grafts had been made the trees produced fruits which had the same size, shape and flavour, but whose colour was red. Also the cherries ripened at a later date. Had the hybrid tree been older its inherent characters would have been more firmly established and this would not have occurred. 2. A young hybrid seedling of Malgorzhatka pear flowered for the first time in 1927. Some flowers of that tree were pollinated with the pollen from

Mitchurin's Winter Beurré, and resulted in a fortnight's delay in ripening as compared with self-fertilized fruits. In this particular instance the pollen of another variety exerted a mentor effect upon the young hybrid. 3. A fully grown pear hybrid (Bergamot Novik) produced during the first three years of cropping a few early ripening fruits having Bergamot shape. In the second year, after a few Malikovka scions had been grafted to the crown of the tree, there was a heavy crop, with a fortnight's delay in ripening of the fruits and a thorough change in their shape. Moreover, the fruits of the scion mentor Malikovka itself had grown double their ordinary size.

811. KOLESNIK, I. D. 634.11-1.541.11  
**Changes in the nature of fruit trees brought about by different surroundings.**  
 [Russian.]

*Vernalization, Moscow, 1939, No. 1(22), pp. 121-4.*

Stem cuttings taken from four apple varieties (Winter Golden Pearmain, Glogerovka, Yellow Bellflower, Calville Beauty) coming from 11 different localities in U.S.S.R. were top worked to bearing trees in Odessa [age of the trees not stated—ED.]. Each tree was worked with a single variety, but with scions obtained from the eleven different places. There were marked differences in the appearance of the fruits within the same variety.

812. EINSET, O. 634.11 : 581.145  
**Correlation of number of seed to weight of fruit in the apple.**  
*Gartenbauwiss., 1939, 13 : 351-3, bibl. 6.*

From experiments at the New York Experiment Station the correlation of fruit weight to seed content would appear to vary with locality and season. Varietal differences are also indicated.

*Soils, manures and cultural practice.*

813. MAGNESS, J. R., AND REGEIMBAL, L. O. 634.11-1.416.1 : 581.192  
**The nitrogen requirement of the apple.**  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 51-5, bibl. 6.*

A summary of some data on the nitrogen content of various tissues of the apple tree. On well-manured trees the nitrogen content of the fruit (excluding seeds) will be about 0.04 lb. per 100 lb. of fresh fruit. This nitrogen is lost to tree and orchard when fruit is removed. The nitrogen in the seeds of a tree maturing 2,000 fruits would be 0.1 lb. The nitrogen loss to the same tree from blossom drop of 40,000 blossom would be 0.09 lb. The total nitrogen in the leaves at midsummer is about 1.50 lb. per tree and is reduced to 0.60 lb. at leaf fall. The wood of new shoots contains 1% nitrogen on a dry basis. New trunk and branch tissue contains 0.2 to 0.3% nitrogen, old sap wood and heart wood contains 0.1% or less nitrogen. The total nitrogen required for the annual growth of a 20-25-year tree in addition to that translocated from old tissues does not exceed 15% or 0.12 lb. per year. The bark stores nitrogen in fairly large quantities. The quantity of nitrogen tied up in the bark each year is approximately 0.09 lb. The residual nitrogen in the roots of well-grown trees would amount to 0.29 lb. Full bearing apple trees have a nitrogen requirement of from 1.5 to 1.75 lb. actual nitrogen per tree per year. Almost 1 lb. of this is permanently removed from the soil. The remainder returns with leaf fall. These data, it is emphasized, refer to nitrogen intake and not to fertilizer applications.

814. SUDDS, R. H., AND MARSH, R. S. 634.11-1.841.5  
**Some results and suggestions regarding the use of calcium cyanamid on apples.**  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 36-40, bibl. 6.*

Some deductions are drawn from apple fertilizer experiments with cyanamide still in progress in West Virginia, U.S.A. The trees are York Imperial, 25 years old. Cyanamide has considerable potentialities for injury. Even when little or no foliage damage is visible, cyanamide may cause some physiological preconditioning which may influence the tree at a later date. A deep heavy soil containing a moderate amount of organic matter does not eliminate all danger from

cyanamide. Ring fertilizing single tree or larger plots, a common method of applying fertilizers in the States, may be a questionable practice, because, although the grass injury may be desirable, undesirable and at the time invisible damage may be done to the tree. In commercial orchards conditions favouring cyanamide injury are very common.

815. WILLIAMS, C. F. 634.25-1.84

**Fall fertilization of peach trees in the Sandhills.**

*Bull. N.C. agric. Exp. Stat. 321, 1939, pp. 15.*

In this and in bulletin 322 (see abstract 816) the effect of giving nitrogen at different times to peach trees in a poor sandy soil is considered. The nitrogen was given in the form of sodium nitrate. Actually yields declined during the 5 years of the trials, but, although it was obvious that the ideal manurial programme had yet to be found, it was possible to draw certain conclusions from the experiments made. Nitrogen was assimilated by the roots at temperatures above freezing but was not distributed to the parts above ground at temperatures below 45° F. The application of nitrogen in August or October resulted in increased reserves being formed in the tree during the winter—which was not the case following application later than October—and in a response in growth and yield approximately the same as that from similar applications the following March. If, however, the March application was entirely omitted, fewer buds per shoot resulted and it is suggested that the autumn dressing should supplement the March dressing. The data indicate the need for good nutritional conditions throughout the season rather than the desirability of heavy manuring at any particular time. Post harvest applications tended to avoid early dormancy and so increase resistance to winter injury, but it is thought that a fertilizer programme including more slowly available nutrient applied in spring and early summer should have equally good effects. The use of cover crops should help.

816. WILLIAMS, C. F. 634.25-1.84

**Nitrogen fertilization of bearing Elberta peach trees in the Sandhills.**

*Bull. N.C. agric. Exp. Stat. 322, 1939, pp. 24.*

Experiments were started after serious losses had been incurred in peach trees as the result of cold injury to determine some of the factors involved in cold resistance in the Sandhills district. In view of the soil conditions, a light deep infertile sand, it was decided to study the storage reserve foods in the tree in relation to growth and fruiting as influenced by differential nitrogen manuring. Uniform amounts of potash and phosphates were applied, enough to ensure that they would not be limiting in their effects. Winter crops of vetch were used in the 5 years of the experiment. Nitrate of soda was applied, the basic annual rate being 3 lb. per tree, given either all at once or in two or three doses. Times of application were (1) as the buds were swelling, (2) before June drop and turning in of the cover crop, (3) after harvest and (4) when sowing the cover crop, i.e. about 1 October. Yields decreased each year throughout the trial on all treatments and after the second year were unsatisfactory. Increasing the amount of nitrogen increased yields but there was little difference in the results of 3 lb. and 6 lb. per tree. March applications were associated with increased number of fruit buds per inch of terminal. Increased nitrogen prior to harvest slightly delayed ripening. Post harvest nitrogen resulted in greater length of terminal growth the following year. Differential nitrogen treatment affected the rate of terminal growth but not the time in which it took place, which appeared to depend on the weather. It did not affect time of blossoming. No winter injury followed post harvest nitrogen applications. These tended to delay dormancy and leaf fall and so reduced the response of trees to warm weather during the winter, which made them less susceptible to cold injury.

817. CULLINAN, F. P., SCOTT, D. H., AND WAUGH, J. G. 634.25-1.8

**The effects of varying amounts of nitrogen, potassium and phosphorus on the growth of young peach trees.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 61-8, bibl. 7.*

Nutritional sand culture experiments with peaches are described. With 1-year-old peaches increase of root and top growth was obtained when the nitrogen content of the nutrient solution

was increased up to 60 parts per million and with potassium up to 10 parts per million; with phosphorus no significant difference in growth was obtained above 4 parts per million, but with 2 parts per million growth was reduced significantly. The potassium content of the leaf is an accurate index of the percentage of this element available in the nutrient solution.

818. ROGERS, W. S. 634.11-1.67  
**An apple irrigation trial, using soil moisture meters.**  
*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 118-26, bibl. 9.*  
 The experiments described here were carried out in 1934 at East Malling on Early Victoria and James Grieve apple trees. Eight trees of each variety received the equivalent of 8.9 in. rain given in two applications by the furrow method in June and July, eight similar trees in each case being left unirrigated. Moisture meters showed that lateral water penetration was less than vertical. Neither the irrigated nor the control plot became excessively dry and no tree reached the wilting point. The result of irrigation appeared in an 11% increase of size of fruit. There was no appreciable increase in bitter pit incidence in storage. Although under the conditions of the trial the application of water was not economic its results indicate that irrigation suitably applied might well be justified in some areas in England in certain seasons.

819. PAINTER, A. C., AND WATES, B. L. 634.22-1.542.27  
**A further experiment in thinning the fruit of Victoria plums.**  
*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 139-44, bibl. 3.*  
 Further experiments on Victoria plum thinning [see *Ibidem*, 1928-30, II, *Suppl. (H.A., 1 : 151)*], are reported here. On this occasion the trial was of different degrees of thinning heavily laden trees, namely to 1 inch apart and 2 inches apart between the stalks. Sixty trees in all were used. The heavily thinned trees produced more large fruit and much less small fruit than the less heavily thinned trees. Quality as represented by general appearance was much better in the larger fruit irrespective of treatment. Fruit from the heavily thinned trees matured earlier. Market returns for the fruit from the heavily thinned trees was £102 as against £104 for the others. To have produced a large proportion of fruit of National Mark size would have necessitated more drastic thinning.

820. BOYNTON, D., AND SAVAGE, E. F. 631.432 : 634.1/7  
**Soils in relation to fruit growing in New York. Part XIII. Seasonal fluctuations of soil moisture in some important New York orchard soil types.**  
*Bull. Cornell agric. Exp. Stat. 706, 1938, pp. 36, bibl. 23.*  
 Experiments carried out over a period of two years showed that a lack of soil moisture may only in a very few instances limit the productivity of New York orchards on well-drained, relatively permeable orchard soils which permit of rooting to a depth of 4 feet. They indicate also that low permeability coupled with poor drainage and the presence of rocks at a shallow depth may be responsible for a direct lack of soil moisture and result in low productivity of the orchards.

821. BOYNTON, D. 634.1/7-1.4  
**Soils in relation to fruit growing in New York. XIV. Tree behavior on important soil profiles in the Finger Lakes area.**  
*Bull. Cornell agric. Exp. Stat. 711, 1938, pp. 21, bibl. 12.*  
 Fruit growing is on the decrease in the Finger Lakes area of New York State owing to high hazards from spring and early autumn frosts, low winter temperatures and hail. The author gives an account of the soil profiles encountered over the area and shows how soil conditions are likely to affect the success of planting.

## SMALL FRUITS, VINES, NUTS.

822. DUPOUY, L. 634.75  
 Les fraises de Plougastel.  
*Rev. hort., Paris, 1939, 26* : 486-90, bibl. 7.  
 The cultivation of strawberries in the neighbourhood of Plougastel, Finistère, is described. The varieties chiefly grown are Royal Sovereign, Mme Moutot (a cross between Royal Sovereign and Docteur Morère) and Sutic (the latter probably a local name). Royal Sovereign is degenerating and is less planted in consequence. The picking of Mme Moutot begins at the end of May and is over by mid-June. This strawberry suffers from a disease which results in the leaves drying off and the fruit failing to ripen. It travels well but is less appreciated in England, where much of the crop is marketed, owing to excessive sweetness. It is propagated by runners while Royal Sovereign and other varieties occasionally grown are propagated by division. Planting usually follows a beet or potato crop, i.e. one that has to be well manured and hoed. No crop is taken the first year and that year the ground is usually interplanted with wheat, peas or barley. The stubble or pea haulms are afterwards dug in by hand and form a valuable humus. An objection to this intercropping is the sudden drying of the shallow soil after the shade of the crop has been removed, particularly as the summer heat is then at its maximum. Following the removal of the catch crop the entire population turns out to hoe and remove runners and this work does not cease till growth slows down in autumn. Replanting is done after two crops have been taken. Five years elapse before the ground is again used for strawberries.

823. HOWELLS, D. V. 634.75  
 Strawberry culture.  
*Misc. Publ. Dep. Agric. Scot. 12*, 1939, pp. 28.  
 This publication was originally reprinted from the Scottish Journal of Agriculture, Vol. 17, 1934, and has now been revised and expanded. It affords in concise form a manual of instruction for growing strawberries in Scotland with notes on picking, packing and marketing, and descriptions of 17 varieties. The following diseases and their control are dealt with at some length:—Red core or Lanarkshire strawberry disease (*Phytophthora* sp.), virus diseases (yellow edge, crinkle, etc.), mildew (*Sphaerotheca Humuli*), strawberry leaf spot (*Mycosphaerella Fragariae*), tarsonemid mite (*Tarsonemus pallidus*), strawberry aphid (*Capitophorus fragariae*), strawberry weevil (*Anthonomus rubi*), red spider (*Tetranychus telarius*), and raspberry (clay coloured) weevil (*Otiorrhynchus singularis*).

824. CHEAL, W. F. 634.75  
 The cultivation of the strawberry crop in Holland.  
*Fruitgrower, 1939, 87* : 125-6, bibl. 4.  
 In this short, interesting article the author describes the salient features of strawberry growing in Holland both in the open, under lights and in glasshouses. Generally speaking more attention is paid to manuring, especially potash manuring, than in England. Diseases would not appear to give so much trouble. It is noticeable that in one district at least beds are ploughed up after the third crop as a matter of routine. The effect of varying light conditions on strawberry growth is being investigated and it has already been shown that with the variety Deutsch Evern a period of light limitation to 12 hours from May to the beginning of July will induce flower bud formation with consequent fruit formation in September and October. The most popular varieties are Jucunda and Deutsch Evern.

825. DARROW, G. M., AND MORROW, E. B. 634.75  
 Breeding new strawberry varieties.  
*Bull. N.C. agric. Exp. Stat. 320*, 1939, pp. 12.  
 Of the 60,000 seedling strawberries of known parentage bred by the U.S. Department of Agriculture and grown to fruiting at the Coastal Plain Branch Station, Willard, N.C., three

have been outstanding at Willard during the last five years and have lately been successfully tested by groups of growers. They are Fairmore (Blakemore  $\times$  Fairfax), Daybreak (Missionary  $\times$  Fairfax) and Eleanor Roosevelt (Bellmar  $\times$  Fairfax). Descriptions are given and suggestions for growing these are made.

826. Darrow, G. M. 634.75

**The Northstar strawberry.**

*Circ. U.S. Dep. Agric.* 517, 1938, pp. 2.

Northstar is a cross of Howard 17 and Redheart made in 1928 at the U.S. Plant Introduction Garden, Glenn Dale, Maryland. It is here described. It is recommended for trial in the Northern United States.

827. Peacock, N. D. 634.75-1.16

**The relative importance of various factors influencing profits in strawberry production.**

*Tech. Bull. Mich. agric. Exp. Stat.* 162, 1939, pp. 75, bibl. 53.

This bulletin, as the title implies, is largely concerned with the economic side of the strawberry industry with special reference to Michigan conditions, and all cultural operations are viewed from that standpoint. It is interesting to note that Michigan figures show that the cost of production represents nearly half of the total cost for the first crop, whereas harvesting and handling the fruit when mature accounts for approximately three quarters of the cost of the second crop. Choice of soil, selection of stock, cultural and manurial operations, climate and competition and how they affect the balance sheet are all discussed.

828. Brooks, A. N. 634.75-1.415

**Relation of soil reaction to strawberry production in central Florida.**

*Press Bull. Fla agric. Exp. Stat.* 513, 1938, pp. 2.

Experience has shown that the best soil reaction for strawberry growing in central Florida is approximately pH 5.5. Tables are given showing the amounts of hydrated lime or ground limestone which must be broadcast per acre in order to change the reaction to give this reading. It has been found that very acid soils, approx. pH 4.0-4.5, cause the death of the plants, while reactions of 4.6-5.0 cause stunting and discoloration of the leaves. In excessively alkali soils, pH 6.5 and higher, the root tips are persistently killed off until the entire root system has an appearance similar to that seen in root-knot nematode injury.

829. Wallace, T. 631.8 : 634.723 + 634.711 + 634.75

**Summary of results of manurial experiments on black currants, raspberries and strawberries at Long Ashton, 1924-1937.**

*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 17-39, bibl. 7.*

The main conclusions drawn by the author are as follows:—Farmyard manure was of great importance to black currants and strawberries, potash deficiency appeared to be the primary limiting factor for raspberries and black currants and was possibly important for strawberries; nitrogen and phosphate deficiencies were both important for black currants and the former also affected the cane growth significantly but not the cropping of raspberries. The incidence of *Pseudopeziza Ribis* was decreased by potash deficiency, and increased by deficiency of nitrogen and of phosphate. Strawberry diseases and mite were unaffected by manuring. As regards strawberries highly significant yield increases resulted from farmyard manure and from complete organic manuring including shoddy. The increase was rather smaller from a complete artificial fertilizer. Dried blood was not a satisfactory source of nitrogen for strawberries. Differences in manuring did not affect ripening season.

830. BEAKBANE, A. B. 634.714/717 + 631.635.7  
**Trials of loganberries, blackberries and hybrid berries.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 213-7.*

This is a revised version of the article by the same author in *Scientific Horticulture*, 1939, 7 : 64-70, for which see *H.A.*, 9 : 440.

831. GARNER, R. J., AND HAMMOND, D. H. 631.535.7 : 634.71  
**Leaf-bud propagation of loganberry and youngberry and blackberries.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 218-21, bibl. 7.*

A method of propagating loganberries, youngberries and blackberries by means of leaf cuttings is described. Every leaf with its bud on the selected shoot may be used except the unexpanded leaves at the tip. To remove the leaf bud a shallow cut is made below the bud ; this is joined by a second cut starting  $\frac{1}{2}$  inch above the bud and passing underneath it while not penetrating the pith below ; in other words the bud and its leaf are pared off. After detachment the leaf buds must be kept moist until planting, which should not be delayed. The cuttings may be set in cold frames 2 inches apart in rows 5 inches apart. The bud is just covered with the medium leaving the upper surface of the leaf exposed to light. The frames are covered and shaded. Wilting must be avoided and the usual watering, not overdone, is needed. In 4 weeks air may be admitted and in 6-8 weeks the lights can be removed. The cutting bed during these trials was composed of freshly dug soil, one barrow-load of humus and one barrow-load of white sand to each 6 ft.  $\times$  4 ft. frame, the added material being incorporated in the top 6 inches of soil and trodden and levelled off. A normal rooting percentage should be 40-50%. This could be improved by bottom-heat, but the object of the work is to provide a quick and inexpensive method for commercial growers especially of varieties, such as youngberry and parsley-leaved blackberry, which do not respond well to tip-layering. Even with plants that tip-layer well the number of layers per plant is limited to about 6 whereas two shoots of leaf-buds should produce about 20 plants. The plants grown on from these leaf-bud cuttings have proved most vigorous. The best time for the work is from July to September and cuttings should not be disturbed until spring.

832. EVREINOFF, V. 634.72  
**Origines et ancêtres des groseilliers à grappes cultivés. (Origins and ancestry of cultivated currants.)**

*Bull. Soc. nat. Hort. Fr., 1939, 6 : 135-46.*

The ancestors of the currants cultivated in Europe are, according to Janczewski (1907), *Ribes rubrum* L., *R. vulgare* Lam. and *R. petraeum* Wulf. *R. multiflorum*, the fourth wild European species, is absolved from complicity on the grounds of its habitual sterility and distance from the early centres of cultivation. The author agrees with Janczewski that most of the cultivated varieties are descendants of *R. vulgare*, but Bunyard thinks that *R. rubrum* has produced a large number of varieties. In any case many varieties must have come from hybrids. Janczewski's and Bunyard's classifications are briefly outlined. Bunyard's is the more practically convenient but it is complicated by the number of characters. The present author produces a simpler classification based like the others on botanical characters but, he claims, simpler and more easily understandable. There are 5 groups, namely, Versailles, Imperial, Gondouin-Prince Albert, Hollandaise and Anglaise. The characters of these are described. Lists of the currants assigned to each group are given.

833. FINCH, A. H., HILGEMAN, R. H., TATE, H. F., STREETS, R. B., AND WEHRLE, L. P. 634.8  
**Grapes in Arizona.**

*Bull. Ariz. agric. Exp. Stat. 162, 1939, pp. 249-92.*

Although commercial grape growing in Arizona is largely confined to Thompson's seedless grapes for the fresh market, this bulletin contains much comparative tabulated information on a number of both American and European table grape varieties. In addition methods are recommended for dealing with pests and diseases and for pruning.

834. MÜLLER-STOLL, W. R. 634.8 : 577.15.04  
 Wuchsstoffversuche mit Reben. I. Einwirkung von Wuchsstoffgaben auf Rebschnittholz. (Growth stimulant experiments on vines. I. The effect upon cuttings.)  
*Gartenbauwiss.*, 1939, **13** : 127-53, bibl. 12.  
 The experiments described here were made at the Research Institute of Freiburg in Breisgau. With good material dipping woody vine cuttings for 24 hours in 0.005%  $\beta$ -indolyl-acetic acid solution induced increased root and shoot formation. As regards strength of solution the best results were got with 0.002 heteroauxin. Higher concentrations increased root formation but in other respects were harmful. Part of the trials were devoted to observations on the effect of growth-promoting substances on callus formation and its possible influence on grafting technique. It was found that by the application of growth substances the apical ends of vine cuttings could be induced to callus better. This fact can, with certain precautions, be made use of when grafting.

835. OINOUE, Y. 634.851 : 581.162.3  
 Kinds of sugars and pollen germination in *Vitis vinifera* L. [Japanese, English summary 9 lines.]  
 Reprinted from *J. hort. Ass. Japan*, 1938, **9** : 134-40, bibl. 24.  
 The author reports that the germination percentage, vigour and time taken for the pollen tube to rupture vary greatly according to the sugar used in the germination medium. Disaccharides are better than monosaccharides and both of these are superior to tri- and tetrasaccharides. Of the disaccharides cane sugar is the best.

836. OINOUE, Y. 634.8 : 581.145.2 : 546.27  
 Effect of boron on the setting of grapes in the Muscat of Alexandria.  
 Reprinted from *J. hort. Ass. Japan*, 1938, **9** : 141-3, bibl. 8.  
 The application of boron,  $Na_2B_4O_7$ , in aqueous solution (0.01% concentration) to 10-year-old Muscat of Alexandria vines on 420 A stock 20 days before flowering, resulted not only in better germination of the pollen grains from the treated vines, but also in more than twice the set of fruit. Moreover, application of a 0.001% solution to the stigmas at blossoming time also resulted in greatly increased set of berries.

837. BREVIGLIERI, N. 634.8  
 La viticoltura della regione di Eger. (Viticulture in the Hungarian Province of Heves.)  
 Reprinted from *Progresso vinicolo*, 1938, Vol. **16**, pp. 15.  
 A brief account of viticultural practice in one of the most important vine growing districts of Hungary, especially for red wines.

838. ORAMAN, N. 634.8  
 Der Weinbau des Vilayets Ankara und Ampelographie der wichtigsten im Vilayet angebauten Sorten. (Viticulture in the Ankara Vilayet of Turkey and ampelography of the most important varieties of vine grown there.)  
*Arb. Yüksek Ziraat Enstitüsü, Ankara*, 1937, Heft 61, pp. 206.

839. TRUET, H. 634.55-1.541.11  
 Contribution à l'étude des porte-greffes en Algérie. II.\* Porte-greffes de l'amandier. (Rootstocks for almonds in Algeria.)  
*Rev. Hort. Agric. Afr. N.*, 1938, **42** : 109-11.  
*Apricot.* The native apricot (mish-mish) is sometimes advised as a stock for almonds on deep soils where it grows naturally. However, it is not completely compatible, being liable to breakage

\* Part I (General discussion), *Ibidem*, pp. 80-4, *H.A.*, 8 : 373.

under stress of wind or heavy cropping or for undetermined causes. With the peach as an intermediate stock between it and the almond scion it is more satisfactory. *Almond*. The almond is the ideal stock on dry, stony or calcareous soils, in fact anywhere where the roots can penetrate deeply enough to utilize their exceptional powers of extracting water from the subsoil. It objects to damp clay soils, compact subsoils and insufficient drainage. *Peach*. The peach is generally a good stock for almond on sandy light soils, preferably irrigated, where the changes in humidity are rapid and pronounced. On peach the almond bears heavily but is short-lived. Usually compatibility is good and the union perfect, but with some peach varieties of the oases compatibility is less complete and congestion arises at the union, leading to frequent breakages. *Myrobalan*. This stock enables the almond to be grown on argilo-calcareous soils, which can be irrigated. The stock is less vigorous than the almond scion and this causes heavy bulging at the union ; the tree lacks solidity and must be kept low and sheltered from the wind. *St. Julien plum*. On thin soils with compact clay subsoils St. Julien may be used, but it is advised only for private gardens where almonds are desired at all costs.

840. SITTON, B. G., AND DODGE, F. N. 634.521-1.541.11  
**Growth and fruiting of three varieties of pecans on different seedling rootstocks.**

*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 121-5, bibl. 5.

Differences are noted between Mobile pecan grafted on *Hicoria aquatica* and on *H. Pecan*, also between Sehley and Stuart each on seedlings of the *H. Pecan* varieties Moore and Waukeenah. The trees were 8 years old. The trees on *H. Pecan* seedling rootstocks averaged 3 times larger in cross section area of tree trunk and yielded 4 times as many pecans in 1937 as those on *H. aquatica*. Trees on *H. aquatica* were chlorotic every year, in one year the condition was partially corrected by a spray of ferric sulphate. This chlorosis seems to be related to the effect of soil alkalinity on *H. aquatica*, since on acid soil it does not appear nor does any marked dwarfing. No abnormal unions were noticed. The differences between *H. Pecan* varieties Moore and Waukeenah were slightly in favour of Moore.

841. SMITH, C. L. 634.521 : 581.144.2 : 581.192  
**Seasonal variations in the carbohydrate and nitrogen content of roots of bearing pecan trees.**

*J. agric. Res.*, 1938, 57 : 449-60, bibl. 21.

Lateral roots of bearing pecans were analysed in both an off and an on year. Starch tended to reach its maximum in late autumn after which it continued to decrease to a minimum in early summer. It was the most variable of the constituents determined and its concentration appeared markedly to influence fruiting. Reducing sugars were low and showed no consistent seasonal variations. Non-reducing sugar, however, was present in appreciable amounts and varied with the starch, although to a smaller extent. Total nitrogen was low at all times. It decreased during rapid spring growth and increased during winter. Nitrogen concentration was largely independent of dry-matter content.

842. SKINNER, J. J., FOWLER, E. D., AND ALBEN, A. O. 634.521-1.4  
**Pecan soils of the Gulf and South-eastern States and maintenance of their fertility.**

*Circ. U.S. Dep. Agric.* 492, 1938, pp. 24, bibl. 32.

The information afforded here, while particularly applicable to soil conditions in the Gulf and South Eastern United States, should be useful to those interested in pecan production in other parts of the world. Success under the conditions considered appears to be greatly influenced by drainage, though there are instances of well-drained soils on which pecans do badly. Details are given of the success achieved under differing soil and sub-soil conditions in some 15 districts. Manuring, including the use of green crops, is considered for each type of soil and recommendations are made for manuring pecans of different ages.

843. ROMBERG, L. D., AND SMITH, C. L. 634.521 : 577.15.04  
**Effects of indole-3-butyric acid in the rooting of transplanted pecan trees.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 161-70, bibl. 4.*

The application of 4 mg. of indole-3-butyric acid to the tap roots of pecan trees, 5 and 7 and 10 years old at transplanting, greatly increased root production even in the adjacent laterals. The best response was shown with trees of which the tap-roots were shortened to 24 inches, possibly due to adverse soil and temperature conditions below the 24 inch level. The growth substance was applied by means of tooth picks cut to 4 cm. and soaked in the solution for 24 hours before insertion in the tap-root through holes bored for the purpose with an electric drill using a 7/64 inch bit. Lanolin and dough pastes containing the growth substance were also inserted in similar holes. Lower concentrations were less effective and the lanolin and dough pastes were also wasteful and appeared to lose strength by diffusion of the growth substance into the soil.

844. MCKAY, J. W., AND CRANE, H. L. 634.533 : 581.162.3 : 575.182/3  
**The immediate effect of pollen on the fruit of the chestnut.**

*Proc. Amer. Soc. hort. Sci for 1938, 1939, 36 : 293-7, bibl. 11.*

Differences were produced between the mean weight of nuts on the same chestnut trees as a result of pollination by different pollens. Pollen of Superb, a Japanese variety bearing large nuts, produced larger nuts on male-sterile (*Castanea crenata*) and on a variety of *Castanea mollissima* than two other pollens. On the other hand pollen of CI on male-sterile, on another variety of *C. crenata*, and on the above-mentioned variety of *C. mollissima* gave smaller nuts than three other pollens. The immediate effect of pollen on the weight of the nut is interpreted as an influence of the pollen on embryo development and is a type of xenia not frequently met with in horticultural plants. The experiments were carried out at the U.S. Horticultural Station, Beltsville, Maryland, and elsewhere.

#### PLANT PROTECTION OF DECIDUOUS FRUITS.\*

845. PRESCOTT, J. A. 631.454  
**Soil deficiencies.**

Reprinted from *Sci. Rev.*, 1938, pp. 8-21.

This paper formed the 6th T. S. Hall Memorial Lecture. In it the author discusses the deficiency symptoms of the major elements with particular reference to their incidence in Australian soils and agriculture. The following points are interesting to horticulturists:—Australian soils seem to be well supplied with magnesium except in parts of N.S. Wales, where a leaf yellowing of citrus has been found associated with a low Mg content of leaves and to respond to dressings of magnesian limestone. Tea yellows in East Africa has been traced to sulphur deficiency. Potassium deficiency symptoms in fruit trees have been worked out at Long Ashton in England. Copper deficiency is known to cause exanthema of citrus in Florida, W. Australia and N.S. Wales and a dieback of other fruit trees also responds to copper salt treatment. Boron deficiencies have been noted in top rot of tobacco and heart rot of sugar beet, in internal cork of apples, in brown heart of swedes and turnips. Zinc deficiency is responsible for mottle leaf of citrus, rosette of pecan and little leaf of peach.

846. WALLACE, T. 634.1/7-2.19 : 631.811.6  
**Magnesium-deficiency of fruit trees.**

*J. Pomol.*, 1939, 17 : 150-66, bibl. 31.

An account of previous work relative to magnesium deficiency in various countries and for various crop plants is given and the possible rôle of magnesium in plants is discussed. Reference is made to the relationship of magnesium to calcium and potassium and to the problem of

\* See also 747.

magnesium-toxicity in plants. The possible importance of magnesium-deficiency in problems of spray injury is indicated. Evidence of magnesium-deficiency in apple trees at 3 centres in England is given and it is shown how the composition of the leaves of terminal shoots may be used to determine the condition of the foliage with regard to supplies of lime, magnesia and potash. Where supplies of calcium and magnesium are adequate in apple leaves, the amounts present are similar to those in tobacco leaves of satisfactory quality. Methods of treating soils with magnesium-containing materials in cases of magnesium-deficiency are given. [From author's summary.]

847. SPINKS, G. T., AND CLOTHIER, G. E.

632.111 : 634.1/7

**Frost damage at Long Ashton in 1938.**

*A.R. Long Ashton Res. Stat. for 1938*, 1939, pp. 54-62, bibl. 2.

Spring frost damage at Long Ashton between 17 April and 8 May was worst at the lowest points of the plantations as in 1935. On the level ground slightly higher than this there was severe damage in parts, but not in the same places as in 1935. There were indications of greater damage to apple trees in grass than to those in cultivated ground and to weak blossom than to strong. Worcester Pearmain and Emneth apple varieties were relatively resistant, but Bramley's Seedling was very susceptible. Apart from very late blooming varieties which were almost immune the stage of development of blossoms did not appear to affect the amount of injury in apples. Among plums Czar, Pershore and Wye Cross were the most resistant, among raspberries Lloyd George was badly affected, Preussen fairly resistant.

848. MANZONI, L.

632.111 : 634.1/8

**Osservazioni su frutta colpita da gelo nella primavera 1938. (Notes on frost damage to fruit in the spring of 1938 in Northern Italy.)**

Reprinted from *Note Fruttic.*, 1939, Anno 17, No. 4, pp. 4-14.

The author deals mainly with damage done to pears. He notes, however, that apricots were very deceptive. The fruits were actually growing large at the time of the frosts in Mid-April and at first sight appeared to be undamaged, but gradually the growth slackened and ceased, they reddened up as if ripening and fell at the beginning of May. A large number of pears fell at once or at the end of May. The author sectioned many which had remained on the tree and examined the sections. These are illustrated here and show various stages of disorganization of seed and surrounding tissue. It was generally found that the longer the damaged pear remained on the tree the worse became its internal damage and in some cases large hollows were found surrounded by brown and dead tissues.

849. FIELD, C. P.

632.111 : 634.1/7

**Low temperature injury to fruit blossom. I. On the damage caused to fruit blossom by varying degrees of cold.**

*A.R. East Malling Res. Stat. for 1938*, A22, 1939, pp. 127-38, bibl. 10.

The material used was apple and blackberry blossom. Samples either taken direct or after storage overnight at 50° F. with the cut ends in water were submitted to 1, 3, 6 or 12 hour periods of 32° F., 30°, 29°, 28° or 26°, the blossom being exposed on a table in the constant temperature chamber with the cut end of the shoot covered with a pad of damp cotton wool applied in the field at the time of cutting. The injury received is described with special reference to the changes effected in the ovary. Varietal differences in susceptibility to low temperature injury are discussed. Slow cooling appeared to retard the appearance of damage. The time taken to thaw was found to be unimportant. At similar temperature wet blossoms were more quickly affected than dry. The relative susceptibility of Crab A and Court Pendu Plat at different stages of flower development differed. The effect of injecting glycerin into shoots and flowers of blackberry was to reduce susceptibility. The injection of dextrose and urea had no effect.

850. POTTER, G. F. 632.111  
**Low temperature effects on woody plants.**  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 185-95, bibl. 61.*  
 Various types of winter injury of woody plants are discussed from the data of a large number of investigators, references to whose works are given in the bibliography.

851. KISSER, J. 634.51-2.111 : 581.45  
 Die Häufung von Bildungsabweichungen an den Blättern von *Juglans regia* L. als Folge von Spätfrösten. (**Changes in leaf character of *Juglans regia* L. as a result of late frosts.**)  
*Gartenbauwiss., 1939, 13 : 94-110, bibl. 15.*  
 Rather warm weather in March, 1938, in Germany was followed by severe frosts in April and May. This resulted in an unusually frequent occurrence of malformed leaves in *Juglans regia* L. The changes in leaf character were of a varied nature, affecting either the number of leaflets on the leafstalk, or the size or shape of leaflets, or else resulting in some form of partial or complete division of the leaves.

852. ADAM, D. B. 634.8-2.14  
**The injury of grapevines by lightning strike.**  
*J. Aust. Inst. agric. Sci., 1938, 4 : 162-4, bibl. 3.*  
 Phenomena considered to have been caused by the effects of lightning on grape vines, var. Grenache, growing at Watervale, S. Australia, are recorded. No vines were entirely killed. The most striking symptoms were defoliation, and death and greyish discoloration of the tops of a large proportion of the vertically growing shoots. Lower down on these same shoots the normally green cortex was altered to a dark brown, while lower still this discoloration was confined to the internodal region. Other noticeable symptoms were bright red leaves, and in some cases abundant callus formation beneath the dead cortical tissues. The latter gave the node the appearance of an enlarged joint. On many leaves short sections of the veins were browned. In a few cases bunches of grapes were seen in which severe russetting occurred, the berries often being split and exposing the stone.

853. VERNER, L. 634.11-2.19 : 581.145.2  
**Histology of apple fruit tissue in relation to cracking.**  
*J. agric. Res., 1938, 57 : 813-24, bibl. 13.*  
 Comparable tissues of the fruit skins of Stayman Winesap, a variety very liable to cracking, and of five varieties actually immune to cracking were sectioned and microscopically examined. Results of the examination suggest that the susceptibility of Stayman Winesap apples to cracking is due chiefly to premature cessation or restriction of growth in the hypodermal layer. The phenomenon of cracking would appear to be due to the failure of the peripheral fruit tissues to keep pace in growth with that of the cortex. This retardation of growth in the hypodermal layer appears to be related in some way to exposure of the fruit to sun and general air movement and is virtually absent in tissues of heavily shaded fruits.

854. VERNER, L. 634.23-2.19  
**Reduction of cracking in sweet cherries following the use of calcium sprays.**  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 271-4, bibl. 4.*  
 Cracking in cherries at Idaho University was greatly reduced by spraying the fruit on the trees with solutions containing calcium, including bordeaux mixture. The residue left on the fruit by the calcium sprays is, however, an objectionable feature in the practical application of the method. Calcium hydroxide left the least residue. The fruit can be sprayed when quite small.

855. WORMALD, H. 632.1 + 632.3/4 + 632.8

**Notes on plant diseases in 1938.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 167-72.*

Certain non-parasitic, fungal, bacterial, and virus diseases of fruits and hops, observed during 1938, are noted. These include (1) severe scab infection on apples due to unfavourable weather conditions in March and April, (2) angular leaf spot of apples (*Phyllosticta angulata*), (3) medlar leaf blight (*Fabraea maculata*), (4) unusually severe attacks of strawberry mildew (*Sphaerotheca Humuli*), (5) septoria leaf spot of black currants (*Septoria Ribis*), and (6) severe outbreaks of *Verticillium* wilt and nettlehead disease in hops. [Author's summary.]

856. GRIGSBY, B. H. 634.711-2.8

**Physiological investigations of red raspberry plants inoculated with red raspberry mosaic.**

*Tech. Bull. Mich. agric. Exp. Stat. 160, 1938, pp. 27, bibl. 46.*

Physiological activities of healthy, masked, and mosaic-infected Latham raspberries were studied. Leaf analysis showed that there was a decrease in simple sugars and starches in mosaic and masked plants. Sucrose occurred in increased amounts in mosaic-infected plants. Total nitrogen was found to be in smaller quantities in mosaic-infected plants, nitrate nitrogen content was also lower, while ammonia was higher. Diastatic activity appeared to be accelerated in plants exhibiting mosaic symptoms. Photosynthesis was less in plants showing marked symptoms of disease. Respiration proceeded at a higher rate in diseased tissue. A higher rate of transpiration was exhibited by the leaves of mosaic-infected plants. There was a larger amount of chlorophyll per unit area of leaf in the mosaic-infected plants. Spectrographic analyses indicated a high amount of silicon, a greater percentage of ash in the content of plants collected in the morning than in that of plants collected in the evening, and a lower calcium and a somewhat higher potassium content in the diseased tissue.

857. HUBER, G. A., AND SCHWARTZE, C. D. 634.711-2.753-2.8

**Resistance in the red raspberry to the mosaic vector *Amphorophora rubi* Kalt.**

*J. agric. Res., 1938, 57 : 623-33, bibl. 8.*

The results of greenhouse tests on susceptibility of different red raspberry varieties to *Amphorophora rubi* were also found to hold good in the field. On four varieties, Lloyd George, Pyne Imperial, Pyne Royal and Indian Summer *A. rubi* failed to reproduce and maintain its population. On four others reproduction was slow and populations remained small. On the remaining nineteen aphids fed and reproduced freely. Resistance to *A. rubi* was shown to be inherited and transmitted when a resistant variety was crossed with a susceptible one. Lloyd George was found to be heterozygous for resistance, transmitting resistance to only part of its in-bred and hybrid seedlings.

858. NAGY, R., RIKER, A. J., AND PETERSON, W. H. 632.314 : 581.192

**Some physiological studies of crown gall and contiguous tissue.**

*J. agric. Res., 1938, 57 : 545-55, bibl. 36.*

Analysis was made of the galls and contiguous tissue from tomatoes, red raspberry roots and sugar beets. Generally speaking the composition of gall tissue resembled that of young plants, being high in nitrogen and low in fibrous material. Results of the analysis are set out and discussed.

859. LOPATIN, M. I. 634.23-2.314

**Influence of crown gall on growth of the cherry.** [Russian.]

*Plant Protection, Leningrad, No. 18, 1939, pp. 169-73.*

A study at the Giant Garden (U.S.S.R.) over one growing period of a hot dry summer showed that crown-gall affected the growth of young cherry trees. The growth was particularly poor

of trees with swellings at the base of the root and on the side roots. Trees with swellings at the root-collar or at the base of the root only or on the side roots only were less affected.

860. WORMALD, H. 634.23-2.314

**Bacterial rot of cherry fruits.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 173-5, bibl. 3.*

Bacterial fruit spot of cherries has not so far occurred to a serious extent in this country. When found it is usually seen accompanying bacterial canker and leaf spotting. On the four occasions when it has been seen *Pseudomonas prunicola* and *P. mors-prunorum*, generally the latter, have been isolated from such fruit lesions.

861. HOPKINS, J. C. F. 634.75-2.4 +2.8

**Three important strawberry diseases.**

Reprinted from *Rhod. agric. J. as Bull. Minist. Agric. S. Rhod.*, 1108, 1939, pp. 6, bibl. 3.

Mildew, yellow edge and severe crinkle, important strawberry diseases in Southern Rhodesia, are here described, and control measures are suggested.

862. MOORE, M. H. 632.42 : 634.11

**Apple scab control. The problem and some recent research findings as regards its solution.**

*Fruitgrower*, 1939, 87 : 569-70, reprinted in *A.R. East Malling Res. Stat. for 1938, A22, 1939*, pp. 265-70.

The author summarizes the results of experiments carried out on scab control at the East Malling Research Station in recent years. He stresses the necessity for protective treatment if the best results are to be achieved. He considers the sources of infection\* and how a consideration of these should affect the spray programme. It is shown that early or late seasons may cause the failure of scab control in any year. The importance of correct timing of treatment is stressed and recommendations are made with regard to the best methods of spraying, choice of fungicide, use of spreaders, etc.

863. MARSH, R. W., AND MUNSON, R. G. 632.42 : 634.11

**Apple canker investigations.**

*A.R. Long Ashton Res. Stat. for 1938, 1939*, pp. 78-83.

MUNSON, R. G.

**Observations on apple canker I.**

*Ann. appl. Biol.*, 1939, 26 : 440-57, bibl. 26.

MARSH, R. W.

**Observations on apple canker II.**

*Ibidem*, 26 : 458-69, bibl. 13.

The article in the Long Ashton report is a summarized version of the other two articles. Among points determined are the following :—Spore discharge of the canker fungus *Nectria galligena* ceases during dry periods and is much reduced at temperatures below 40°, but during wet periods it goes on throughout the year. Ascospores are set free by violent ejection from the peritheciun, the maximum discharge being in February and the minimum in September. Conidia are distributed mainly in spring and autumn. A fairly good control of leaf scar infection was got by preventive spraying with a bordeaux-casein-oil mixture. Fresh cuts are subject to infection for about 2 months. The most promising wound protectant tested was a mixture of mono-hydrated copper sulphate, hydrated lime and linseed oil.

\* (1) the previous year's dead scabbed leaves lying on the ground, and (2) the pustules on the young shoots and buds of certain susceptible varieties.

864. OGILVIE, L., HICKMAN, C. J., AND CROXALL, H. E. 631.462 : 632.41  
**The control of damping-off fungi by means of chemicals applied to the soil, with special reference to weak formaldehyde solutions.**

*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 98-114, bibl. 26.*

The following chemicals were tried in different ways against damping off (mainly *Pythium* sp.) :— mercuric chloride, calomel, organic mercury compounds, copper sulphate, copper carbonate, Cheshunt compound, bordeaux mixture at 4-4-50 or 5-5-50, cuprous oxide, aluminium sulphate, zinc oxide, permanganate of potash, sulphuric acid, acetic acid, cresylic acid, pyroligneous acid, ammonium hydroxide, bleaching powder, and formaldehyde. Formaldehyde proved the most efficient as a soil fungicide and, if used according to Haenseler's method at dilutions of 1-200 to 1-600 for watering seed boxes after the seed has been sown, it will markedly control damping-off. It was thus successfully used with seeds of pea, tomato, cucumber and sweet pea, but apparently did damage to seed of stock and other ornamental plants.

865. WORMALD, H. 634.723-2.4  
**The septoria leaf spot disease of black currants.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 176-9, bibl. 3.*

The same control measures are recommended for black currant leaf spot (*Mycosphaerella Ribis* (*Septoria Ribis*)) as for the gloeosporium leaf spot caused by *Pseudopeziza Ribis* (*Gloeosporium Ribis*), namely spraying with bordeaux immediately after fruit picking.

866. ANON. 632.42 : 634.1/2  
**Monilia-ziekten van appel, peer, kers, morel, pruim, abrikoos en perzik. (Brown rot diseases of apple, pear, cherry, plum, apricot and peach and their control.)**

*Meded. PlZiektDienst, Wageningen, 88, 1938, pp. 5.*

867. MASSEE, A. M. 632.6/7  
**Notes on some interesting insects observed in 1938.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 180-5.*

Brief notes are given on some unusual insects found on fruits and vegetables in 1938. *Aphodius fimetarius* L. was found damaging the roots of cabbages at Knockholt, Kent. The cherry fruit moth (*Argyresthia nitidella* Fabr.), and the apple leaf miner (*Lyonetia clerkella* L.), proved more common than usual. The apple clearwing (*Conopia myopiformis* Borkh.), was found infesting the stems of peach in an unusual manner. Reference is also made to certain aphides which infest apple and pear.

868. HANSON, A. J., AND WEBSTER, R. L. 632.6/7 : 634.71/5  
**Insects of the blackberry, raspberry, strawberry, currant and gooseberry.**

*Pop. Bull. Wash. agric. Exp. Stat. 155, 1938, pp. 38, bibl. 9.*

An account of the life history and control of certain insects attacking small fruits in the Puget Sound region of Washington. The insects discussed include 2 on blackberry, 10 on raspberry, 13 on strawberry and 4 on currants and gooseberries. In addition other insects also recorded on the first three fruits in that district are listed.

869. BAILEY, S. F. 632.73  
**Thrips of economic importance in California.**

*Circ. Calif. agric. Exp. Stat. 346, 1938, pp. 77, bibl. pp. 4.*

This circular deals with pear, flower, bean, citrus, onion, gladiolus, greenhouse, grape, toyon, hollyhock, lily, sugar-beet and composite thrips (i.e. thrips generally found on zinnias, marigolds and other *Compositae*) thus covering nearly all thrips of major economic importance in the United States.

870. KEARNS, H. G. H., AND UMPLEBY, E. 634.11-2.753 + 2.654.2  
**Experiments on the control of pests of apple nursery stock by means of dipping.**  
**Woolly aphid and red spider. Progress report No. 1.**  
*A.R. Long Ashton Res. Stat. for 1938*, 1939, pp. 72-7, bibl. 4.  
 Complete immersion for 30 minutes in November of the roots of nursery apple trees, after removal of soil, in a winter wash (3.0% grade A tar oil + 3.0% grade A petroleum oil) did not affect after growth of trees. It resulted in the removal of most but not all woolly aphid and of a considerable amount of red spider eggs. A sulphite lye emulsion of the oils remained stable in the dipping tank throughout the winter.

871. VÄXTSKYDDSANSTALT, STOCKHOLM. 632.753 : 634.11  
**Blodlusen och dess bekämpning. (Woolly aphid and its control.)**  
*Flygbl. Växtskyddsanstalt, Stockholm* 43, 1939, pp. 5.  
 The best control in Swedish experiments in 1938 was obtained with 7-10% winter carbolineum and 7% spring carbolineum used more than once. Hand painting with 10-20% carbolineum, with 0.2-0.4% nicotine solution, or with methyl alcohol was successful for any colonies which then appeared in the summer. *Aphelinus mali* has been introduced into Sweden but its effectiveness there is not as yet determined.

872. GREENSLADE, R. M., AND MASSEE, A. M. 634.75-2.753 + 2.654.2  
**The control of strawberry aphid and tarsonemid mite.**  
*A.R. East Malling Res. Stat. for 1938*, A22, 1939, pp. 186-90.  
 Nicotine (8 oz.) and soft soap (8 lb. per 100 gallons) at present afford the best, but not complete, control for strawberry aphid (*Capitophorus fragariae* Theo.). 100% control was actually achieved by an atomized spray containing nicotine but this is too dangerous to the operator. Dusts were found useless. The only satisfactory way of dealing with the tarsonemid mite (*Tarsonemus pallidus* Banks) is to treat strawberry runners with warm water before planting, for which see Massee, *Misc. Publ. E. Malling Res. Stat.* 14, 1936.

873. MASSEE, A. M. 635.64 : 632.654  
**A species of gall-mite (Eriophyidae) injurious to tomato.**  
 Reprinted from *Ann. Mag. nat. Hist.*, 1939, 3 (ser. 11) : 617-9.  
 A description of a new Moroccan gall-mite species, *Eriophyes lycopersici* sp.n.

874. JOESSEL, P.-H. 632.782  
**Le carpocapse dans la région d'Avignon de 1933 à 1937. (Codling moth in the Avignon district 1933-37.)**  
*Ann. Épiphyt. Phytogén.*, 1939, 5 : 219-48, bibl. 63.  
 The position with regard to codling moth in the Avignon district of southern France in the years 1933-37 and the methods of control used are thoroughly discussed. Great differences in efficiency are noted between the different types of arsenical sprays but these do not appear to be related to the nature of the metal used such as lead, aluminium, copper or lime. When the season is too far advanced for arsenic, fluorine, rotenone-containing mixtures, nicotine, white oil, and probably also thiadiphenylamine can be substituted. The best treatments according to the stage of development of flowers and fruit are considered at some length.

875. HELSON, G. A. H. 632.78 : 634.25  
**The oriental peach moth (*Cydia molesta* Busck.). Investigations in the Goulburn Valley, Victoria. Progress report for the seasons 1935-38.**  
*Pamphl. Coun. sci. industr. Res. Aust.* 88, 1939, pp. 23, bibl. 11.  
 For a number of years attempts have been made to control the oriental peach moth (*Cydia molesta*) in the Goulburn Valley, Victoria, but so far with little success. Field tests with a number of most promising insecticides failed to give a satisfactory control because of the peculiar habits of the larva and the moth, the vigorous growth of the peach, particularly under irrigation,

and the growth of the fruit in dense clusters. Field tests with different types of bands for the trapping of hibernating larvae showed that cardboard bands treated with beta-naphthol were the best. Biological control gave promising results, *Macrocentrus ancyllivorus* being the most promising of the introduced parasites.

876. JONES, T. H. 632.78 : 634.1/7

**Cankerworms.**

*Leaf. U.S. Dep. Agric.* **183**, 1939, pp. 8.

Two distinct but closely related insects are referred to as cankerworms, namely *Alsophila pometaria* Harris and *Paleacrita vernata* Peck. Practical notes on control are given. Actually where efficient control of codling moth is carried out, no further action should be necessary.

877. DICKER, G. H. L. 632.78 : 634.71

**The bramble shoot-webber (*Notocelia uddmanniana* L.).**

*A.R. East Malling Res. Stat. for 1938*, **A22**, 1939, pp. 191-8, bibl. 4.

An account is given of the life history and habits of the tortrix moth, *Notocelia uddmanniana*, a pest of certain *Rubi*. The author bred two species of hymenopterous and one species of dipterous parasites from the larva. Of control measures tried so far only atomized pyrethrum applied in April at the time of emergence of the caterpillar from hibernation gave good results on a small scale. A field trial with the same spray in early May was disappointing.

878. DIRECTIE VAN DEN LANDBOUW, HOLLAND. 632.94 + 632.95

Sproeien en sproeiers. (**Sprays and spraying apparatus.**)

*Meded. PlZiektDienst Wageningen* **33**, 1938, pp. 64, fl. 0.40.

First the diseases and pests of different fruits, vegetables and ornamentals are touched on and notes given of treatment recommended. This is followed by a consideration of the different insecticides and fungicides commonly used and of the spraying apparatus necessary and their use. Finally costs of the different apparatus and operations are discussed and illustrations are given of the machinery used.

879. — BERTAUD-ROSSI (MME). 632.951.1

La roténone, ses propriétés et ses applications. (**Properties and applications of rotenone.**)

*Ann. Mus. colon. Marseille*, 1938, **6** (5e Ser.) : 2 : 1-58, bibl. in text.

This is a résumé of much of the present knowledge on the subject of derris with particular reference to the properties and uses of rotenone. It contains a good deal of useful information in small compass.

880. HYRE, R. A. 634.11-2.952.1 : 581.132

**The effect of sulfur fungicides on the photosynthesis and respiration of apple leaves.**

*Mem. Cornell agric. Exp. Stat.* **222**, 1939, pp. 40, bibl. 22.

Results are reported here of a study of the effect of certain sulphur fungicides on the photosynthesis and respiration of McIntosh and Baldwin apple leaves under controlled temperature, light and humidity conditions. One- and two-year-old trees grown in the greenhouse were used in the experiment. The chief reduction of photosynthesis due to lime sulphur, with and without arsenate of lead, occurred when the lower leaves were sprayed. Total reduction at 100° F. was about 25% and differed little from that at 70° and 80° F. Bordeaux induced less reduction than the sulphur sprays. Lime-sulphur caused a greater reduction than the wettable sulphurs. Many of the other differences noted from different treatments were not significant.

881. HEINICKE, A. J. 634.11-2.952.1 : 581.132  
**The influence of sulphur dust on the rate of photosynthesis of an entire apple tree.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 202-4, bibl. 4.*

The reduction in the relative rate of photosynthesis of a Baldwin apple tree due to sulphur dusting was confined largely to days of high temperature and only once for a few hours exceeded 11 per cent. With the same tree in the previous year after lime-sulphur spraying the reduction was to 37 per cent. of the normal. The experiments were conducted in specially constructed glass assimilation chambers.

882. BRODY, H. W., AND CHILDERS, N. F. 634.11-2.952.1 : 581.132  
**The effect of dilute liquid lime-sulphur sprays on the photosynthesis of apple leaves.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 205-9, bibl. 4.*

Dilute liquid lime-sulphur sprays may cause marked reductions in the apparent rate of photosynthesis of Stayman apple leaves up to 5 days after treatment, even though no visible burning occurs.

883. KESSLER, W. 632.951.2 : 581.174 : 634.11  
Über den Einfluss von Schwefelkalkbleiarsen und anderen Pflanzenschutzmitteln auf den Chlorophyllgehalt des Apfellaubes. (**The effect of certain sprays and washes upon the chlorophyll content in apple leaves.**)

*Gartenbauwiss., 1939, 13 : 154-68, bibl. 8.*

It was found that spraying apple trees with 2% lime-sulphur and 1% lead arsenate preparation or with a new preparation containing no arsenic gave an increase of the chlorophyll content in apple leaves (10% to 30% more per unit leaf area as compared with the leaves of untreated trees). The result was similar to that obtained from ample application of nitrogenous fertilizers. Applications of nitrogen together with spraying resulted in a 30% to 100% increase of the chlorophyll content.

884. SHAW, H. 634.1/7-2.951.2  
**Spray residues on fruit.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 262-4, bibl. 6.*

The author shows how the present tendency is to use sprays that will not leave a residue on the fruit harmful to the consumer or a nuisance to the canner. He notes that the lead arsenate spray for codling moth has been so adjusted that the residue at picking time does not exceed the tolerated maximum. He considers that our best hope for a final solution of the residue problem appears to lie in the extended use of vegetable insecticides and the introduction of sprays made from the many synthetic chemicals which are at present under investigation.

885. SHAW, H., AND STEER, W. 632.951.2  
**Spray residue investigations. III. The influence of petroleum oil and of lime sulphur on the retention of lead arsenate on apples.**

*A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 199-203, bibl. 1.*

The investigation of the effect of additions to a lead arsenate spray was continued in 1938. Oil appeared to increase the arsenical residue except, perhaps, where used with lime-sulphur. Lime-sulphur by itself had no effect. Fruit growth was checked wherever lime-sulphur, with or without oil, was used. For this reason weight of residue per 100 fruits proved better than weight per weight of fruit as a basis for consideration of the results. The apparent loss of residue, in terms of mg.  $As_2O_3$  per kg. of fruit, was accounted for by attenuation due to fruit growth. No evidence was obtained of actual loss by weathering. [Authors' summary.]

886. BERRY, W. E. 632.951.2  
**Spray injury studies. Progress report 1. Some observations on the probable causes of lime-sulphur injury.**

*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 124-44, bibl. 29.*

Symptoms of lime-sulphur injury are described and a list presented showing the relative susceptibilities of some varieties of common fruit plants to sulphur injury. The penetration of spray materials into the leaf is discussed with particular reference to cuticle permeability and the effect of nutritional climatic factors. An experiment is described which suggests that foliage injury from lime-sulphur may be correlated with temperature, humidity and sunshine. Maximum injury occurred when temperature was high, humidity low and sunshine continuous. The possibility that desiccation by spray deposit may be a major cause of injury was investigated. Concentrated sprays of sucrose and calcium chloride produced little damage compared with lime-sulphur. It is concluded that loss of water due to the purely osmotic effect of spray deposit is not alone responsible for spray injury. Detached leaves of Lane's Prince Albert and Laxton's Superb apples exhibit rapid increases in respiration when sprayed with 2% lime-sulphur and show symptoms of injury similar to those observed in the field. Necrotic patches are believed to result from local penetration of spray fluid, but the increase in respiration seems due to a more general physiological effect on the whole leaf. Possible causes of the observed effects are discussed and it is suggested that injury from lime-sulphur of the type resulting in leaf abscission is due to gaseous or volatile compounds, which, the evidence suggests, may be hydrogen sulphide. [Author's summary.]

887. MACDANIELS, L. H., AND HILDEBRAND, E. M. 634.1/7-2.952.2 : 581.145.2  
**The effect of copper compounds applied to spur units during bloom upon the set of apple fruits.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 230-3, bibl. 2.*

Data are presented which support the statement that copper compounds may be applied to apple trees in bloom without seriously reducing the set of fruit.

888. EIDELMAN, Z. M., AND LESNIKOVSKY, G. M. 634.11-2.95  
**The effect of the dates of winter spraying with oil emulsions on the vegetative growth of the apple tree. [Russian.]**

*Plant Protection, Leningrad, No. 18, 1939, pp. 130-5, bibl. 4.*

Winter spraying 6-year-old apple trees (var. Winter Golden Pearmain and Semirenko Reinette) with oil emulsions initially stimulated tree growth, but at the time of flowering the difference had almost disappeared.

889. GROVES, K., MARSHALL, J., AND FALLSCHEER, H. 632.95  
**The injection of spray concentrates. A new procedure for the application of insecticides.**

*Bull. Wash. agric. Exp. Stat. 367, 1938, pp. 12.*

A new method of applying spray mixtures is described. Spray chemicals are used in the form of a ready mixed concentrate and this is injected into the suction line of a high pressure spray pump by a device known as a synchronized spray-concentrate injector.

890. KEARNS, H. G. H., AND MARTIN, H. 632.951 + 632.952  
**Combined washes. Progress report. V.**

*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 66-71, bibl. 6.*

The phytocidal properties of dinitro-ortho-cresol and butyl carbitol thiocyanate, each used in conjunction with petroleum oil, were examined. It was shown that the dinitro-ortho-cresol washes cannot be applied to apples later than the very early green flower stage without risk of serious injury. Black currants and gooseberries with the flower buds exposed suffered complete loss of crop. Red currants proved more tolerant. The washes failed to control aphids that had just hatched from eggs. Washes containing 3.0 per cent. or more of petroleum

oil provided an appreciable control of fruit tree red spider eggs. When applied to plums before egg hatch, the washes provided a high control of plum aphis (*A. padi*) and could be applied with safety just before bud burst. Grade "A" tar-oil emulsions applied at 3.0 per cent. concentration of the oil provided a complete control of plum aphis, and could be applied just before bud burst without causing flower bud injury. [Authors' summary.]

891. MARTIN, H. 632.95  
**Accident prevention in the use of poisonous spray materials.**  
*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 145-53.*

A comparison is made of the practices in different countries to ensure safety from poison residues on fruit or vegetables. The author considers that the grower himself can do much to prevent accidents in this respect and to allay public anxiety. He doubts whether legislation is desirable. Firstly, if the possibility of such poisoning is brought to the notice of the consumer, it may completely and unnecessarily put him off the foodstuff in question. Again, the possibility of poisoning from spray residues is assessed by a prominent American entomologist as on the same level as that of death by a stray golf ball or by falling out of bed. Finally, there is the danger that the tolerances will be put to extreme uses with consequent increase in cost of production.

892. ANON. 632.944  
**Fumigation with hydrocyanic acid gas.**  
*Advis. Leaf. Minist. Agric., Lond., 92, 1938, pp. 4.*

Instructions are given for fumigation with HCN, both using calcium cyanide and sodium cyanide plus sulphuric acid.

893. BREVIGLIERI, N. 634.11-2.48  
 La defogliazione dei meli. (**Defoliation of apples caused by *Phyllosticta prunicola* Opiz. Sacc.**)

Reprinted from *Note Fruttic.*, 1937, Anno 15, pp. 7, bibl. 3.

SMIRNOVA, O. N. 632.78  
**New methods in the control of vine burnet moth.** [Russian.]

*Plant Protection, Leningrad*, No. 18, 1939, pp. 149-50.

LEACH, J. G., AND CURRENCE, T. M. 635.61 : 632.48  
**Fusarium wilt of muskmelons in Minnesota.**

*Tech. Bull. Minn. agric. Exp. Stat.* 129, 1938, pp. 32, bibl. 22.  
 TOMPKINS, C. M., ARK, P. A., TUCKER, C. M., AND 635.61 : 632.41  
 MIDDLETON, J. T.

**Soft rot of pumpkin and watermelon fruits caused by *Pythium ultimum***  
*J. agric. Res.*, 1939, 58 : 461-75, bibl. 45.  
 HORSFALL, J. G., AND HARRISON, A. L. 632.952 : 581.11  
**Effect of bordeaux mixture and its various elements on transpiration.**

*J. agric. Res.*, 1939, 58 : 423-43, bibl. 25.

#### VEGETABLE GROWING.

894. TAUBITZ, A. 635.1/8 : 581.084.2  
 Der wissenschaftliche Gefässversuch mit Gemüsepflanzen. (**Pot experiments with vegetables.**)

*Gartenbauwiss.*, 1939, 13 : 354-405, bibl. 46.

Consideration was given in these experiments at Pillnitz to the best type of medium for use in vegetable pot experiments and the influence of the medium on experimental results. The

exactness of these results was found to become greater up to a given point with increasing amounts of humus in the medium. Different soils appreciably affected the influence of the various nutrients. The experiments showed, moreover, which vegetables, by reason of their yields and the smallest number of relative errors, were especially suitable for nutritional pot experiments. Thus carrots, summer-endives, spring and autumn spinach are the most suitable plants for nitrogen investigations; dill, carrots, and spinach are useful objects for phosphoric acid investigations, while orach and beans lend themselves to potash investigations.

895. OGILVIE, L., CROXALL, H. E., AND HICKMAN, C. J. 635.1/7 : 632.3/4 + 632.8  
**Progress report on vegetable diseases.**

*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 91-7, bibl. 9.*

A brief summary of work on vegetable diseases in the Bristol Province in 1937-8 includes notes on the following :—Asparagus rust and violet root rot; celery blight; dwarf bean stocks resistant to *Fusarium* foot rot, to mosaic disease and to halo blight; runner bean wilt; leek foot rot and rust; lettuce classification and mosaic; onion white rot; pea sickness and bacterial disease; seed treatment with cuprous oxide; boron deficiency trials.

896. WILLARD, D. R., AND SMITH, J. B. 631.82 : 635.1/7  
**The effect of magnesic versus calcic liming materials on calcium in vegetables, forage crops, and on certain soil properties.**

*Bull. R.I. agric. Exp. Stat. 261, 1938, pp. 16, bibl. 31.*

Field experiments in progress since 1909 show that more calcium is produced in leafy vegetables (actually spinach) by the use of calcic lime than by that of magnesic lime when both are applied on an equivalent acid-neutralizing basis. No difference was found in effect on crop production. Figures are also given showing the effects of the two treatments on soil and sub-soil.

897. VAN SCHREVEN, D. A. 633.491-2.19-1.8  
 De gezondheidstoestand van de aardappelplant onder den invloed van twaalf elementen. (**The influence of twelve chemical elements on the state of health of the potato plant.**) [English summary 17 pp.]

Reprinted from *Meded. LandbHoogesch. Wageningen, deel 43, verhandeling 1, pp. 166, bibl. pp. 15.*

This is an illustrated account of a detailed study of the deficiency and excess diseases of the potato made at Wageningen in 1932, 1933 and 1934. Deficiencies in the following elements were considered, K, P, N, Ca, Mg, Mn, Fe, B, Cu, Zn, Na, and Cl. The large list of references to the subject should be of considerable value.

898. MORLEY DAVIES, W. 633.63-2.19  
**Acidity and manganese deficiency problems in connexion with sugar beet growing.**

GREENHILL, A. W. 633.63 : 546.27  
**The effect of boron on the growth and quality of sugar beet.**

PETHERBRIDGE, F. R. 633.63-2.6/7  
**Sugar beet pests.**

ROEBUCK, A. 633.63-2.6/7  
**Pests of the sugar beet crop in the Midlands.**

STIRRUP, H. H. 633.63-2.3/4  
**Sugar beet diseases.**

*Ann. appl. Biol., 1939, 26 : 385-92, 392-6, 397-9, 399-401, 402-4.*

The above are titles of papers given at the Annual General Meeting of the Association of Applied Biologists held in London, February 10, 1939.

899. BYSTROV, A. A. 635.1/7 : 631.531  
**Hastening seed germination in the umbelliferous vegetables.** [Russian.]  
*Vegetable growing, Moscow, 1939, No. 4, pp. 25-8.*  
 A special method is described by which carrot and parsley seed was induced to germinate more quickly in the field and, moreover, resulted in appreciably higher yields. The treatment essentially consists of soaking the seed in fresh water at 15-16° C. for 24 hours. After this the seed is placed on filter paper in Petri bowls and kept at room temperature (15-18° C.). On the 5th to 8th day the seed starts and immediately ceases germinating. It should be then dried more thoroughly for about 2 days by spreading it on newspaper and covering the thin seed layers with some light and dry material to prevent penetration of fungi (particularly moulds). It is advisable to treat the seed in this way shortly before sowing, since it will carry on the germinating process more evenly and also more quickly, but the seed treated in this manner may be also stored for a considerable period, provided it is stored in a sufficiently dry condition.

900. ROLAND, G. 632.19 : 635.11 + 635.41  
 Onderzoeken verricht in 1937 over de vergelingsziekte en enkele minerale gebreken bij de biet en de spinazie. (**Investigations in 1937 on chlorosis and certain mineral deficiencies in beetroot and spinach.**) [French summary 2 pp.]  
 Reprinted from *Tijdschr. PlZiekt.*, 1939, **45** : 1-22, bibl. 25.  
 Beet and spinach chlorosis caused by virus and carried by *Myzus persicae* and *Macrosiphon solanifolii* were investigated at Wageningen in 1937. It was found impossible to induce infection by artificial inoculation of juice. Spinach may be considered an important host plant of the virus. The nutritional conditions apparently exert considerable influence on its incidence. Suggestions are made for helping to avoid it.

901. HAVIS, L. 635.13 : 581.144.2  
**Anatomy of the hypocotyl and roots of *Daucus carota*.**  
*J. agric. Res., 1939, **58** : 557-64, bibl. 9.*  
 In this study the anatomical development of the root and hypocotyl, i.e. the edible portion of the carrot, is traced from the seedling stage to edible maturity at the end of the first season.

902. BEATTIE, J. H., AND BOSWELL, V. R. 635.23 : 631.523  
**Longevity of onion seed in relation to storage conditions.**  
*Circ. U.S. Dep. Agric. **512**, 1939, pp. 22, bibl. 7.*  
 On account of the relatively high value of onion seed, cold storage is strongly recommended for all stocks in regions having high humidity, high temperature or both. It is estimated that large quantities of onion seed may be stored cheaply. Since deterioration is very quick under warm humid conditions, shipments should be made directly to cold storage warehouses, from which seed could be withdrawn as required for planting or sale. Onion seed should be shipped in moisture-proof bags such as are used for certain hygroscopic chemicals, and it should be previously dried to below 6% moisture. The moisture content of the seed must be kept low whether cold-stored or not. If difficulty is encountered in maintaining a low moisture content of seed, low temperature storage becomes the more imperative. Storage temperatures of 34° to 36° F. are best.

903. ZELLER, A. 635.25 : 581.192  
 Zur chemischen Anatomie der Küchenzwiebel. (**The chemical anatomy of the onion.**)  
*Gartenbauwiss., 1939, **13** : 66-82, bibl. 10.*  
 The difference in concentration of juices extracted from dead and live onion scales was insignificant. The sugar values for different sections of a single scale varied. A certain constancy was established in the vertical distribution of sugars. There were usually more total sugars in interior scales than in exterior scales. The highest glucose/saccharose ratio was always

in the extreme outer scale. The molar concentration of sugar increased towards the centre of the onion.

904. THOMPSON, H. C., AND SMITH, O. 635.25 : 581.143

**Seedstalk and bulb development in the onion (*Allium Cepa L.*).**

*Bull. Cornell agric. Exp. Sta.* **708**, 1938, pp. 21, bibl. 12.

A study was made at Ithaca, New York, of the effect of size of onion sets and of storage temperature on subsequent seedstalk development and on yield of marketable bulbs as well as of the effect of temperature and length of photoperiod during growth on seedstalk development and on bulb formation. The following notes are taken from the summary. Large sets of 3 onion varieties produced yearly a much higher percentage of seedstalks than did medium size and small sets. Storage temperature also had a marked effect on subsequent seedstalk development and on yield of marketable bulbs. This was particularly marked in the case of large and medium size sets. Sets stored at 40° and 50° F. produced the largest percentage of seed stalks and the lowest yields of marketable bulbs. Of the temperatures used 30° and 32° F. were the best. The high temperature of 60° to 70° was not satisfactory because of the growth and shrivelling of the sets in storage. With sets that had been stored at temperatures least favourable for seedstalk development, the larger the sets the higher was the yield of marketable bulbs. The small sets produced a lower yield than did the medium size sets in every comparison, and a lower yield than did the large sets in those comparisons in which the percentage of seedstalks developed from large sets was low. The percentage of split or divided bulbs was much higher from large sets than from medium and small sets. No correlation could be established between the rate of respiration in storage and early seedstalk development within the ranges of temperatures used. Plants grown at 50° and 60° F. in the greenhouse developed seedstalks under the normal length of day of winter and early spring. Prolonged exposure to light hastened seedstalk development. At 70° to 80° seedstalks did not develop either under the normal length of day or under long day conditions. Bulbing did not take place at 50° to 60° under a 15-hour day, but at 60° to 70° and at 70° to 80° it did take place. Bulbing began at least a month earlier at 70° to 80° than at 60° to 70°. No bulbing took place under the normal length of day of winter and early spring at any of the temperature ranges employed.

905. JARY, S. G., AND AUSTIN, M. D. 632.7 : 635.34

**Investigations on insect pests of *Brassica* seed crops in Romney Marsh I and II.**

*J. S.-E. agric. Coll. Wye*, 1939, No. **44**, pp. 73-83, bibl. 18, and p. 84.

The small arable acreage in Romney is partly devoted to seed crops, especially peas and swedes, while lately a hybrid kale has also been grown. The *Brassica* crops have, however, recently been unsatisfactory mainly owing to the ravages of *Meligethes aeneus* F., *Ceuthorrhynchus assimilis* Park and *Dasyneura brassicae* Winn. especially the first. The life cycle of *M. aeneus* in the Marsh and control measures are discussed. Dusting was undertaken with pyrethrum, derris and lead arsenate both in the field and to test toxicity in insectaries, but results on the whole were somewhat disappointing. Preliminary trials with an atomized pyrethrum fluid gave more promising results. Kale was found to be more heavily attacked than swedes.

906. VANSTONE, E., AND KNAPMAN, C. E. H. 635.356 : 631.8

**On the quantities of nitrogen, phosphoric acid, potash and lime removed from the soil by a crop of Roscoff broccoli during its growth.**

*J. Pomol.*, 1939, **17** : 85-98, bibl. 6.

The work was carried out on an experimental plot in Devon. Roscoff broccoli during the year between planting and harvest removed from the soil per acre:—nitrogen 204 lb., phosphoric acid 70 lb., potash 240 lb., lime 110 lb. The chemical composition of the plants from other localities and under different manuring showed a general similarity with the chemical composition of those under investigation. The removal of material from the soil was continuous and the rates of such removal are given. The dry matter of the curd contains 40% of protein and is equal in nutritive value to dried milk. Served with butter it becomes a perfectly balanced

food. The dry matter of the leaves contained over 20% of protein and should prove of value as food for stock. It compares well with palm kernel cake and young grass. Good quality curds have a higher percentage of potash and a lower percentage of nitrogen than soft curds.

907. KNOTT, J. E. 635.41 : 612.014.44 : 551.52

**The effect of temperature on the photoperiodic response of spinach.**

*Mem. Cornell agric. Exp. Stat.* **218**, 1939, pp. 38, bibl. 35.

Temperatures prevailing at various growth stages definitely determined the response of spinach plants, as shown by the development of the seed stalks, to the photoperiod. Hence, it is concluded that spinach should not be arbitrarily classified as a long-day plant.

908. STOREY, I. F. 635.41 : 632.8

**Experiments and observations on a virus disease of winter spinach (*Spinacia oleracea*).**

*Ann. appl. Biol.*, **26** : 298-308, bibl. 13.

A study of a disease of winter spinach in the Thames Valley shows it to be a virus. It is suggested that the main source of contamination is the outdoor vegetable marrow crop. Sowing should be postponed till the latter half of September, since the disease is worst in early sown crops.

909. LLOYD, J. W., AND MCCOLLUM, J. P. 635.51 : 631.55

**Yields of asparagus as effected by severe cutting of young plantation.**

*Bull. Ill. agric. Exp. Stat.* **448**, 1938, pp. 12.

Severe cutting of a young asparagus plantation results in reduced subsequent yields and inferior market quality. Though light cutting in the first year is not desirable, in the second it seems to improve production. It is recommended that the best plan is to cut for two weeks in the second year after planting and for four weeks in the third year. It is suggested that an eight week cutting period is satisfactory in a mature plantation.

910. WOODMAN, R. M. 635.52 : 631.8

**Studies in the nutrition of vegetables.\* Phosphate deficiency and yield tests on sand cultures of May King lettuce.**

*J. agric. Sci.*, 1939, **29** : 229-48, bibl. 4.

In experiments at the Horticultural Research Station, Cambridge, with May King lettuce absence of phosphate caused stunting of the plant, bronzing of the leaves and red stalks. Phosphate alone produced purple to bronze and apple-green flat, stunted, rosettes with broad crinkly leaves and red stalks. Water alone caused stunted, straggly, purple plants with relatively long crimson stalks. With insufficient phosphate purple patches appeared, increasing in intensity as the phosphate in the medium diminished. The best growth, tenderest leaves and earliest maturity were in those media in which the greatest concentrations of phosphate were used. The yields obtained with the two greatest concentrations of phosphate were greater by 40% of the lesser yields than the two statistically equal yields obtained with the lower amounts of phosphates. Increasing the phosphate supply increased the fresh and dry weights of the tops relatively more than those of the roots and in general increased the percentages of moisture in both tops and roots.

911. WOODMAN, R. M. 635.52 : 631.83

**Effects of variation in the supply of potash to lettuce grown under glass.**

*J. Pomol.*, 1939, **17** : 167-80, bibl. 6.

The paper describes two experiments carried out to discover the effects of deficiencies in the supply of potassium† on the growth, yield and appearance of May King lettuces grown in sand

\* See also abstract 911 and footnote.

† For effect of phosphate deficiency see abstract 910, and for that of nitrogen deficiency see *Ann. Bot. Lond.*, 1939, vol. 3 (in press).

under glass, at the Horticultural Research Station, Cambridge. Lack of potash gave at first a slightly darker green leaf but later tended to chlorosis. With only small amounts of potash serious scorch resulted, even though the deficiency was not enough to cause serious reduction in size. Absence of potash caused rapid, severe scorch and withering of the lower leaves, so that a narrow, relatively tall plant resulted. The leaves became convex on the upper surfaces between the abnormally wide veins, giving the leaves a crinkled appearance. Large applications of potash did not appear to induce earlier maturity as do large applications of nitrogen or phosphate.

912. KNOTT, J. E., ANDERSEN, E. M., AND SWEET, R. D. 635.52  
**Problems in the production of Iceberg lettuce in New York.**

*Bull. Cornell agric. Exp. Stat.*, 714, 1939, pp. 17, bibl. 4.

A plentiful and relatively constant supply of moisture is essential for good head formation in Iceberg lettuce. It will also reduce tipburn injury. On most muck soils a water table at 18 to 24 inches will provide a suitable moisture content in the surface foot of soil without water-logging. A high level of soil fertility, especially in nitrogen, results in poor heading and severe tipburning during warm weather. Where the level of fertility is very low, an application of 400 lb. of a 5-20-10 analysis to the acre is recommended for early and late plantings or 400 lb. of an 0-20-10 analysis for July or August crops. Newly cleared muck soils, containing small amounts of phosphoric acid and of potash, should be given 500-1,000 lb. of an 0-12-18 analysis to the acre. For early lettuce crops on sandy loam, 10 tons of manure and 1,000 lb. of a 5-10-10 analysis to the acre are recommended. On fertile silt loam or clay loam soils 5-10 tons manure and 500 lb. of 20% superphosphate per acre should be sufficient. If the silt loam or clay soil is very low in fertility 500 lb. of a 10-20-10 analysis is likely to prove more beneficial than superphosphate. The size of the head may be altered by adjusting the spacing given the plants. On muck soils lettuces should be planted 12 inches apart and 18 inches between the rows. Imperial 44 is better adapted for New York State than any other variety yet introduced.

913. AINSWORTH, G. C., AND OGILVIE, L. 635.52 : 632.8  
**Lettuce mosaic.**

*Ann. appl. Biol.*, 26 : 279-97, bibl. 18.

Experiments with different kinds of lettuce and the results of previous investigations lead the authors to suggest the following control measures:—Use only clean non-virus-infected seed. Plant in hilly or open situations, thus decreasing likelihood of *aphis* infestation. Sow winter lettuces fairly late and in frames. Planting out in spring also appears to give less mosaic infection than otherwise. The use of nicotine in glasshouses is effective in reducing *aphis*. Eradicate weeds, especially groundsel. Choose varieties which show mild symptoms only. The authors list a number of lettuce groups showing the response of some 35 to mosaic disease.

914. EFFERSON, J. N. 635.53  
**Economic studies in vegetable farming in New York. VI. Production and marketing of celery, 1936.**

*Bull. Cornell agric. Exp. Stat.*, 715, 1939, pp. 62.

Under New York conditions the earlier celery plants were set the higher was the average yield per acre and the greater the return per hour of labour for both early and late crops. This was partly due to moisture conditions which were more favourable to plants set in May and early June than to those set in late June or July. Also a severe frost in late October destroyed most of the celery still remaining in the fields, which was mostly that set in late June and July. In 1936, which was a particularly dry crop year, higher yields per acre and higher returns for labour were obtained on farms where surface irrigation was practised than on farms where no irrigating was done.

915. SCHULTZ, H., AND RÖDER, K. 635.63: 632.4  
 Freilandbeobachtungen über die Anfälligkeit von Gurken (*Cucumis sativus* L.) gegen Krätze, Blattbräune und Mehltau. (Three important diseases of the cucumber.)

*Gartenbauweiss.*, 1939, 13 : 169-83, bibl. 27.

Disease resistance trials in the field at Grossbeerchen on over one hundred cucumber varieties led to the following conclusions:—*Cladosporium cucumerinum*. There were varietal differences in the degree of susceptibility to this, the variety Delicatesse being least susceptible. The different strains of a single variety sometimes differed in susceptibility. The extent of injury to fruits and shoots was in most cases equally strong. *Sporodesmium mucosum* var. *pluriseptatum*. All varieties were strongly susceptible to this fungus. The same was true of mildew, *Erysiphe cichoracearum*. High humidity favoured the spread of *Cladosporium cucumerinum*, and low humidity that of *Erysiphe cichoracearum*.

916. GASPARINI, M., AND BREVIGLIERI, N. 581.143.26.03 : 635.624 + 635.64  
 Ricerche sperimentali intorno agli effetti della "Jarovizzazione" su alcune piante orticole nei riguardi della precocità della produzione. (Tests of the influence of vernalization on precocity of production in certain horticultural plants.)

Reprinted from *Riv. Soc. toscana Ortic.*, 1939, Vol. 17, pp. 14, bibl. 10.

Preliminary experiments are reported on vernalization of marrows and tomatoes, with brief notes of unsuccessful attempts to apply vernalization to *Salvia patens* and *Aster californica*. The treatment given to the marrow was (1) seed pregermination, (2) seed pregermination and treatment at 30° C. for 7 days, (3) as in (2) but for 11 days, (4) seed pregermination and treatment at 2° for 15 days and for 3 days at normal temperature of 17°. That of the tomatoes was (1) seed pregermination and treatment at 30° for 10 days, (2) seed pregermination and treatment at 30° for 12 days and for the following 3 days at 17°, (3) seed pregermination and treatment at 3° for 12 days followed by 3 days at 30°. In both cases there were untreated controls. Briefly treatments at high and at low temperature resulted in earlier flowering and ripening. It is obvious that each single species needs particular treatment and that this must vary both according to cultural conditions and the nature of the product.

917. HATCHER, E. S. J. 635.64 : 631.52  
 Hybrid vigour in the tomato.

*Nature*, 1939, 143 : 523, bibl. 2.

The greater seed size of the hybrid is attributed to the fact that fewer seeds develop in the hybrid than in the naturally selfed, and therefore, more efficiently pollinated, parent.

918. PLESSETSKY, P. F., AND DOBROVITSKAYA, S. A. 635.64 : 631.547.6  
 The predominance of the character of early-ripening among the F<sub>1</sub> generation of tomatoes. [Russian.]

*Vernalization, Moscow*, 1937, 6 (15), pp. 85-96.

Studies carried out with tomatoes in Odessa by the U.S.S.R. Institute of Selection and Genetics confirmed T. D. Lysenko's theory, namely that "F<sub>1</sub> hybrid plants normally start flowering at the same time or earlier than the early parental forms". 86.3% of the different F<sub>1</sub> tomato hybrids complied with the rule.

919. HOWLETT, F. S. 635.64 : 581.145.1  
 The modification of flower structure by environment in varieties of *Lycopersicum esculentum*.

*J. agric. Res.*, 1939, 58 : 79-117, bibl. 24.

All varieties of tomato studied showed a definite response to environment in respect to the relative length of pistil and stamens. A classification of a number of varieties is made on the basis of the relation of length of pistils to length of stamens. Irrespective of this, however,

the maximum length of pistil in relation to stamens was obtained when the plants were growing under conditions of relatively short daylight, light of low intensity and abundance of readily available nitrogen. The short pistil in relation to stamens was obtained under conditions of long daylight, light of high intensity and only moderate supply of readily available nitrogen. An increase in length of pistils in relation to stamens appears to be associated with carbohydrate deficiency.

920. LESLEY, J. W., AND LESLEY, M. 635.64 : 631.55  
**Unfruitfulness in the tomato caused by male sterility.**  
*J. agric. Res.*, 1939, **58** : 621-30, bibl. 4.

On the Pacific Coast among apparently healthy tomato plants there sometimes occur in very small numbers, i.e. less than 1%, individual plants of great vigour and upright habit, but quite unfruitful. Experiments here described indicate that such plants may be male-sterile segregates from the selfing of fruitful and apparently normal heterozygous plants.

921. BACHER, T. 634.65 : 631.67  
*Forsøg med forskellige Vandingsmaader til Tomater i Vaeksthus. (Methods of watering tomatoes under glass.)*

*Tidsskr. Planteavl.*, 1938, **43** : 485-94, being *Beretn. Forsøksv. PlKult. Krist.*, **319**.

The results of experiments carried out at Virum in the years 1932-6 to test various methods of watering tomatoes under glass are given. The water was either applied in the usual way from above or underground, either through 2-inch drain pipes or through cement pipes porous at the top but impermeable below. There was little economic difference in the results achieved, but it is thought that the saving in labour and water swings the balance in favour of the underground systems.

922. VAN KOOT, Y. 635.64 : 632.8  
*De belangrijkste virusziekten van de tomaat in Nederland. (The most important virus diseases of the tomato in the Netherlands.)* [English summary 1½ pp.]

*Reprinted from Meded. TuinbouwvoorDienst* 10, 1939, pp. 24, bibl. 14.

The most widespread virus diseases of tomatoes in Holland are single virus streak, caused by *lycopersicum* virus I, and complex virus streak, caused by a combination of *nicotiana* virus I and *solanum* virus I. The symptoms of the two diseases are described. For the control of these diseases in the glasshouse it is necessary in the first place to prevent infection from the soil by covering it with sand, by disinfecting it with formaldehyde or by steaming it. When steaming the temperature should be maintained at 90° C. for 10 minutes or at 80° C. for 1 hour. As a result of the steaming treatment 99% of the virus becomes inactivated. Further control measures include the use of healthy seed, disinfection of the nursery beds, hygienic treatment, additional manuring with potash and suppression of black nightshade, which is a host-plant for *lycopersicum* virus I.

923. EL-HELALY, A. F. 635.651 : 632.482  
**A chocolate spot disease of beans (*Vicia Faba*) Part I. Studies on *Botrytis* sp. as the cause of the disease in Egypt.**  
*Bull. Minist. Agric. Egypt* **191**, 1938, pp. 8, bibl. 7.

The chocolate spot, a very serious disease of horse beans in the northern part of Lower Egypt, was found to be caused by a fungus which agrees very closely with *Botrytis Fabae* Sardina.

924. EL-HELALY, A. F. 635.651 : 632.451  
**Preliminary studies on the control of bean rust.**

*Bull. Minist. Agric. Egypt* **201**, 1939, pp. 19, bibl. 34, 6 plates.

Experiments at the field stations of the Egyptian Ministry of Agriculture showed that the spread of bean rust (*Uromyces Fabae*) depends largely on soil moisture, atmospheric humidity,

wind and temperature. Fungicidal seed treatment had no effect on the incidence of the disease, but bordeaux mixture, bouisol, lime-sulphur and sulsol sprays gave exceptionally good rust control. Yield was greatly increased and the grade greatly improved.

925. WOODRUFF, S., AND KLAAS, H. 635.655

**A study of soybean varieties with reference to their use as food.**

*Bull. Ill. agric. Exp. Stat.* **443**, 1938, pp. 42, bibl. 39.

As a result of tests carried out at the Illinois Agricultural Experiment Station in 1934 to 1936, seventeen varieties of soybeans have been selected from a group of 466 vegetable and field types for their better flavour, texture and general appearance. In the case of green beans, shelling time was also a factor on which the selection was based. Twelve varieties subjected to chemical analysis both in the green stage and as mature beans showed differences that were too small or too irregular to indicate important variations in nutritive value. Attempts to preserve the green soybeans with freezing storage methods were very successful, whereas canning and drying were not so successful.

926. ZYCHA, H. 635.8

**Ertragskontrolle bei Champignon-Kulturen. (Checking the yields of the cultivated mushroom.)**

*Gartenbauwiss.*, 1939, **13** : 204-11, bibl. 8.

The need is stressed for a uniform yield control in the mushroom industry. The following measures are recommended :—The yields should be estimated per 1 kg. dry weight of the compost bed, which must be uniform and clearly defined. Pure one-spore cultures should be grown in a nutritive medium which can be exactly described. Uniform control plots should be set up to determine yield fluctuations due to unknown causes.

927. LAMBERT, E. B., AND HUMFELD, H. 635.8

**Mushroom casing soil in relation to yield.**

*Circ. U.S. Dep. Agric.*, **509**, 1939, pp. 12, bibl. 12.

1-inch casing had a considerable effect on mushroom yields. The best time for casing was 2-3 weeks after spawning. Approximately neutral soil gave better yields than very acid or excessively alkaline soil. Ground limestone was more nearly foolproof and, therefore, more suitable than hydrated lime for neutralizing casing soil. Heavy soils usually yielded better than sandy soils. Clay loams and clays seemed preferable whenever their physical condition was such that they did not puddle or cake on the bed. With the soils tested there was a marked reduction in yield as a result of heat sterilization.

928. JARY, S. G. 635.8 : 632.654.1

**Investigations on the insect and allied pests of cultivated mushrooms. XIII.**

**Another tyroglyphid mite.**

*J. S.-E. agric. Coll. Wye*, 1939, No. **44**, pp. 68-72, bibl. 3.

*A Caloglyphus* sp.

LANGE, E. G.

Verbreitung und Schadwirkung der Gewächshausheuschrecke, **Tachycines asynamorus** Adel, in den Gärtnereibetrieben Berlins und Umgebung. (The glasshouse grasshopper as affecting the German glasshouse industry.)

*Gartenbauwiss.*, 1939, **13** : 111-26, bibl. 3.

This insect is becoming increasingly important in Germany.

929. SALMON, E. S. 633.79

**Hops : "English-grown Americans".**

*J. S.-E. agric. Coll. Wye*, 1939, No. **44**, pp. 12-5, bibl. 3.

The term "English-grown Americans" is used to designate the new hop varieties raised at Wye which have equal or superior preservative value and superior flavour to the imported American

hops. Brewer's Gold in particular is now used by some of the leading brewers. The object of the present article is to show that the Hops Marketing Board by their valuations protect hops of inferior brewing quality at the expense of these excellent new varieties, which are incidentally being planted up on a large scale in Canada and U.S.A.

930. FURNEAUX, B. S.

633.79-1.4

**Soils for hop growing.\****J. S.-E. agric. Coll. Wye, 1939, No. 44, pp. 30-6.*

The hop is so hardy that it will continue to live, though not to thrive, under most unfavourable conditions. To thrive it must not only be properly manured but also have a reasonably well-drained soil. Among signs of bad drainage which the soil auger will disclose are the following:—mottling or rusty stains due to uneven distribution of iron. A bluish-grey colour may develop in the soil, generally mottled with shades of orange- or yellow-brown. Rusty concretions known as "cat's brains" and by other local names may also be seen. It is essential to note the depth at which these symptoms appear. Every inch of well-drained soil above this point is valuable. If at three feet or so signs of spring water appear, so much the better. As regards soil texture those of medium texture, the loams, are the most suitable, though Fuggles flourishes on heavy types. Further, uniformity of soil is an advantage for manurial and cultivation purposes.

931. BAILEY, C. R.

577.15.04 : 633.79

**Some preliminary experiments on the use of root initiating substances in hop propagation.\****J. S.-E. agric. Coll. Wye, 1939, No. 44, pp. 47-53, bibl. 5.*

Preliminary trials indicate the possibility of raising large numbers of clonal hop plants from waste hop material with the help of chemical growth-promoting substances. In early spring the first shoots are pulled and later, also, those in excess of the number required for training. These root readily, but it was found that immersing such cuttings of Brewer's Gold for 24 hours in a 1/5,000  $\beta$ -indolyl-acetic acid solution greatly increased and in a 1/2,000 phenyl-acetic solution appreciably increased rate of rooting. In addition immersion of cuttings made from the laterals, which are normally stripped off below the 5 ft. wire or string in  $\beta$ -indolyl-acetic acid 1/10,000 and in  $\alpha$ -naphthalene-acetic acid 1/20,000 resulted in 80% rooted cuttings as against nil in the case of cuttings treated only with water or phenyl-acetic acid. The plants from these cuttings are now under examination. If they prove normal it should thus be possible to raise at least 100 good clonal plants per hill a year.

932. ACWORTH, R. W. H.

633.79

**Hop-pickers tokens.***J. S.-E. agric. Coll. Wye, 1937, No. 40, pp. 158-70, and 1939, No. 44, pp. 143-55.*

A record of tokens found, of the use known to have been made of tokens generally and sometimes in particular, and lists of tokens noted and illustrated from Kent, Sussex, Herefordshire and Worcestershire.

933. GLASSCOCK, H. H.

633.79

**The causes of variation in the ratio bushels of green hops to hundredweight of dried hops.***J. S.-E. agric. Coll. Wye, 1939, No. 44, pp. 16-21, bibl. 2.*

The variation in the number of bushels of green hops required to the hundredweight of dry hops of different varieties grown at East Malling is not constant from year to year. It tends

\* Paper given at Conference on hop growing held at Wye on 11 January, 1939.

to be in the same direction for the varieties considered when any two years or group of years are compared. It is suggested that the factors most likely to be responsible for this are:—the proportion of large to small cones, the amount of seed, the ripeness of seed, and the humidity of the atmosphere at the time of picking. How these factors and others depending more on human agency act is discussed.

934. WARE, W. M. 633.79-2.8  
**The nettlehead disease of hops.\***  
*J. S.-E. agric. Coll. Wye, 1939, No. 44, pp. 41-3, and*  
 OGILVIE, L.  
**The nettlehead disease of hops in the Bristol Province.\***  
*Ibidem, pp. 44-6.*

Although nettlehead appears to be due to a virus, it has not yet been found possible to transmit it to healthy hop plants either by rubbing or by hop aphid. Roguing is essential. It must be done early in the season, directly the symptoms are visible, and must be thorough and include healthy stocks on either side of the affected stock. The rogued material should be burned. The first author calls attention to the fact that there are disease-free strains of the Fuggles at East Malling and he suggests that some of the new varieties such as Brewer's Gold, which give indications of resistance, should be tested in affected gardens.

935. KEYWORTH, W. G. 633.79-2.48  
**Verticillium wilt of hops : a summary of observations during 1938.\***  
*J. S.-E. agric. Coll. Wye, 1939, No. 44, pp. 23-9, bibl. 3, and in A.R. East Malling Res. Stat. for 1938, A22, 1939, pp. 244-8, bibl. 3.*

Two different types of *Verticillium* wilt (*V. albo-atrum* Reinke and Berth.) are now observed on hops, one fluctuating and the other increasing in intensity from year to year. General control measures at present suggested are that bines from infected gardens should not be used as manure for hops, that hops should not be planted next to potatoes or raspberries, since *V. albo-atrum* attacks the former and *V. Dahliae* the latter, and that sets should not be taken from infected gardens.

936. DAVIES, D. L. G. 633.79-2.42  
**A rootstock canker of hops caused by *Gibberella pulicaris* (Fr.) Sacc.**  
*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 115-23, bibl. 9.*

Prevalence of a rootstock canker of hops shown by inoculation experiments to be caused by *Gibberella pulicaris*, of which the conidial stage is *Fusarium sambucinum* Fuck., appeared to be associated with defective drainage. Its symptoms and morphological characters are described.

937. JARY, S. G. 633.79-2.654.2  
**The control of hop red spider.\***  
*J. S.-E. agric. Coll. Wye, 1939, No. 44, pp. 37-8.*

Adequate control appears to be obtainable by treating the hop poles with tar oil wash at 5% before hop growth has started and by the application of lime-sulphur 1 : 100 when hops are in the early burr stage but before the cones form. There are indications that the control given by colloidal sulphur is inferior to that given by lime-sulphur.

\* Paper given at Conference on hop growing held at Wye on 11 January, 1939.

938. SALMON, E. S. 633.79  
 On a tricusate arrangement of the leaves and flowering branches in certain seedlings of the hop.  
*J. S.-E. agric. Coll. Wye*, 1939, No. 44, pp. 9-11.  
 WARE, W. M., AND GLASSCOCK, H. H. 633.79-2.411  
 The downy mildew of the hop in 1938.  
*J. S.-E. agric. Coll. Wye*, 1939, No. 44, pp. 54-8.  
 SMITH, D. C. 633.79  
 Influence of moisture and low temperature on the germination of hop seeds.  
*J. agric. Res.*, 1939, 58 : 369-81, bibl. 9.  
 MENGERSEN, F. G. 633.52  
 Untersuchungen über den Einfluss der Aussaatzeit auf den Ertrag und die wertbestimmenden Eigenschaften des Flachs. (The effect of time of sowing on crop and quality of flax.)  
*Landw. Jb.*, 1939, 87 : 1-111, bibl. 67.  
 CROISIER, W., AND PATRICK, S. 635.656 : 631.531.17  
 Chemical elimination of saprophytes during laboratory germination of seed peas.  
*J. agric. Res.*, 1939, 58 : 397-422, bibl. 16.

## FLOWER GROWING.

939. MANZONI, L., AND ORSENIGO, G. 635.935.84 : 581.11  
 Sulla traspirazione delle foglie verdi e rosse di *Canna indica* L. (Transpiration of the red and green leaves of *C. indica* L.)  
 Reprinted from *Riv. Biol.*, 1938, Vol. 26, Fasc. 2, pp. 10, bibl. 3.  
 Leaf transpiration was measured at the Conegliano Viticultural School in two groups of *Canna indica*, namely, those with green and those with red leaves. In both varieties transpiration was very closely related to total radiation, slightly limiting factors being relative humidity and, in a minor degree, temperature. Transpiration was slightly but constantly superior in the red leaves. In the opinion of the authors this was due to the greater absorption of radiation and hence greater warmth in the red leaves.

940. JONES, L. H. 631.436 : 632.19 : 635.939.872  
 Relation of soil temperature to chlorosis of gardenia.  
*J. agric. Res.*, 1938, 57 : 611-21, bibl. 2.  
 In the trials described here chlorosis was induced in *Gardenia Veitchii* at soil temperatures of 18° C. or less, but at 20° or 22° C., although traces of chlorosis were seen, these did not increase in course of time. This chlorosis at low temperatures was dissipated by a sharp rise in soil temperature maintained for 13 days. It is evident from these trials that soil temperature is a factor which may alter the physiological phases of vegetative and reproductive development.

941. WEINARD, F. F., AND DORNER, H. B. 635.936.751  
 Peonies, single and Japanese, in the Illinois trial garden.  
*Bull. Ill. agric. Exp. Stat.* 447, 1938, pp. 59.  
 As a result of the work carried out at Urbana with material obtained from a number of growers in U.S.A. and Europe, descriptive lists of a great number of peony varieties are given. The lists are arranged alphabetically and include single peonies, Japanese peonies, semi-double and double peonies, peonies other than *albiflora* and unnamed seedlings. Varieties apparently identical, varieties very similar and varieties causing confusion are listed separately. This bulletin should prove useful to growers desiring to correct the confusion existing in the identification of their varieties.

942. WÓYCICKI, S., AND GRZYBOWSKI, M. 635.939.98 : 612.014.44  
Wpływ długości dnia na rozwój i kwitnienie złocieni. (**Studies in photoperiodism as applied to the chrysanthemum.**) [English summary 12 lines.]  
*Ann. Sci. hort.*, 1938, 5 : 141-76, bibl. 13.

In experiments at the Institute of Floriculture, Warsaw, it was found that cutting off daylight by covering the plants from 8 p.m. to 7 or 8 a.m. was effective in bringing the plants quickly into flower. It was also found, however, that covering the plants from 10 a.m. to 2 p.m. resulted in delay and not advance in flowering.

943. MORETTINI, A. 635.939.98 : 612.014.44  
Le applicazioni del fotoperiodismo per anticipare o ritardare la fioritura dei crisantemi. (**The advancement or retardation of flowering in chrysanthemums by light regulation.**)

Reprinted from *Riv. Soc. toscana Ortic.*, 1939, Vol. 17, pp. 10, bibl. 9.

Experiments were carried out on chrysanthemums in 1937 and 1938 at the Azienda Orticola del R. Istituto Tecnico Agrario of Florence. Shortening the period of light hastened flowering when applied to young plants in which the flower buds were not yet visible. The reduction, by envelopment in a black tent, of the hours of light to 8 per day for 25 days resulted in flower production 25 days in advance of normal. If, however, the light reduction only started on 15 August at a time when the flower buds were already visible it did not advance, in fact it might even delay flowering. The very slightly higher temperatures experienced by the treated plants during the night hours had no practical effect on flowering. There was no deterioration in the form of the blooms produced after 25 days light reduction and they fetched a considerably higher price than blooms produced at the normal time. Further trials are to be made this year in order to determine the best time at which to start light reduction, the optimum reduction per day and the minimum duration of treatment necessary to ensure a satisfactory time of flowering.

944. CHOUARD, P., AND VAIDIE, P. 635.939.98 : 612.014.44  
Actions distinctes du photopériodisme sur la formation des boutons et le développement des fleurs chez le chrysanthème. (**Action of photoperiodism on bud and flower formation in chrysanthemums.**)

*C.R. Acad. Sci. Paris*, 1938, 207 : 1444, bibl. 8.

The authors show how a careful study of the effects of light on bud and later flower formation should enable the grower not only to regulate the date of flower bud formation but also the form of the flower and florets.

945. CHOUARD, P. 635.939.98 : 612.014.44  
Quelques effets de l'augmentation de la durée d'éclairement sur la floraison de certaines variétés de chrysanthèmes. (**Effect of increasing light duration on the flowering of chrysanthemums.**)

*C.R. Soc. Biol. Bordeaux*, 1938, 127 : 66, bibl. 3.

By giving additional light, consisting of 300 lux, to the tops of the plant so as to raise the daily light hours to 20 as from 3 July, the author was able to retard flowering in *Chrysanthemum indica* vars. Calypso and Anneau d'Or for a month and longer, but not indefinitely. The two varieties reacted differently to the treatment and the reaction was quite different according to the state and position of the flower buds at the time when treatment started.

946. CHOUARD, P. 635.939.98 : 577.15.04 + 612.014.44  
Action combinée de la folliculine et de la durée d'éclairement sur la floraison des reines-marguerites. (**Effect of folliculin and light on asters.**)

*C.R. Soc. Biol. Bordeaux*, \* 1937, 126 : 509, bibl. 2.

Folliculin applied with a watering can had practically no effect on the flowering of asters. Dihydrofolliculin, on the contrary, hastened flowering but only when the plants received intense

\* See also *Ibidem*, 1936, 122 : 823.

enough light for a not too long period, i.e. 8 hours a day. Its action was entirely inhibited when the daily light period was raised to 15 or 22 hours.

947. SMITH, F. F. 632.654.2 : 635.939.98

**Control of cyclamen and broad mites on gerbera.**

*Circ. U.S. Dep. Agric.* 516, 1939, pp. 14.

Investigations in Maryland, Washington D.C., and New York show that dusting gerbera plants with sulphur was the most effective treatment for the control of the broad mite in the greenhouse. Neither dusting, spraying nor fumigating controlled the cyclamen mite, which was, however, effectively controlled by various heat treatments of the plants with hot water or vapour heat.

948. LONGRÉE, K. 635.937.34 : 632.42 : 551.57

**The effect of temperature and relative humidity on the powdery mildew of roses.**

*Mem. Cornell agric. Exp. Stat.* 223, 1939, pp. 43, bibl. 43.

An account is here given of investigations made on the influence of temperature and relative humidity on the powdery mildew of roses. These factors were studied in their effect on germination of the conidia, mycelial growth and sporulation of the pathogen *Sphaerotheca pannosa* (Wallr.) Lév. var. *rosae* Wor., which causes the disease. These experiments indicate that the mildew cannot be effectively controlled under greenhouse conditions by regulation of temperature and humidity, though its incidence may possibly be kept in check somewhat by keeping both as low as possible and avoiding draughts and extreme changes in temperature. This being extremely difficult except possibly in the winter, fungicides would appear to be the only remedy.

949. BROOKS, F. T., AND EL ALAILY, Y. A. S. 635.937.34 : 632.4

**A canker and die-back of roses caused by *Grifphosphaeria corticola*.**

*Ann. appl. Biol.*, 1939, 26 : 213-26, bibl. 12.

An account is given of the symptoms and cultural study of *Grifphosphaeria corticola*, which causes canker and dieback of roses, and the susceptibility of certain varieties of rose is noted. Although infection may occur at all times except summer, when prevented by the gum barriers formed by the host, the disease is unlikely to become widespread unless neglected. The conidial stage is known as *Coryneum microstictum* B and Br.

950. MITCHURIN, I. V. 633.811

**The influence of parental plants on the characters and properties in hybrids.**

*Mitchurin's selected works*, Voronezh Region Publishers, Voronezh, 1939, pp. 130-1, 12 roubles.

One of Mitchurin's most valued essential oil rose hybrids, World's Glory, inherited all its characters and properties from the grand-parents and only two characters, namely size and the shape of the flower, from its immediate (male) parent.

951. VOGEL, F. 635.955.3

Bodenansprüche von *Kalanchoe Blossfeldiana* (var. *selecta*). (Soil requirements of *Kalanchoe Blossfeldiana* var. *selecta*.)

*Gartenbauwiss.*, 1939, 13 : 327-50, bibl. 6.

A soil reaction within the limits of pH/KCl 5.5-7 proved best for kalanchoe. A mixture of leaf mould, loam and peat proved the best potting mixture.

952. HARTSEMA, A. M., AND LUYTEN, I. 635.944 : 631.544

Snelle bloei van de narcis. (Rapid forcing of narcissus.) [English summary.]

*Meded. Lab. PI Physiol. Wageningen* 56, 1938, pp. 20, bibl. 7, reprinted from *Verh. Akad. Wet. Amst.*, 1938, Vol. 41, Nos. 6 and 7.

King Alfred daffodil was forced into bloom by Christmas by the following method. Stored at 7°-9° C. directly after digging, planted first week in September at 7°-9° C. and, at nose length

of 4 cm. from base of nose, transferred to greenhouse at 17° F. At 7 cm. nose length the heat was increased to 20° C. The first flowers should appear 140 days after starting, i.e. after digging. Planting earlier than September 1st has an unfavourable effect on precocity of bloom. Planting after September 21st, resulted in rather later flowering, but in more rapid succession of bloom. With bulbs dug while the leaves were still green, June 16th, the optimum temperature for flower bud initiation in the 10 weeks before planting on August 23rd, was 13° C. For rapid blooming 9° C. gave quickest results but with a poor flowering percentage. The best flowering percentage was obtained when the bulbs were dug on July 1st, stored at 20° C. for 3 weeks +1 week at 7° C., planted on August 1st at 7° C. and transferred to higher temperatures at nose lengths prescribed above. This treatment produced flowers by December 11th or 12th, i.e. 15 days earlier than normally dug bulbs.

953. KRIJTHE, N. 581.145 : 635.938.46  
 De ontwikkeling der knoppen van enkele voorjaarsgewassen II *Begonia tuberosa* Hort. [French summary.] (Development of the buds of *tuberosa begonias replanted in spring.*)  
*Meded. Lab. PlPhysiol. Wageningen* 58, 1939, pp. 24, reprinted from *Meded. Landb-Hoogesch. Wageningen*, deel 43.

The development of the buds of the tubers of begonias is traced and illustrated. When the tuber is replanted (i.e. any season except the first from seed) usually in May, it is already in the first stage of flower formation. Possibly conditions of winter storage may be found which will advance this period and stimulate later development.

954. HARTSEMA, A. M., AND LUYTEN, I. 635.944 : 631.544  
 Proeven over het uitloopen van de knollen en het vervroegen van den bloei bij *Freezia* hybriden. (Effect of summer pretreatment of *Freezia* hybrids on shooting and early bloom.) [English summary.]  
*Meded. Lab. PlPhysiol. Wageningen* 59, 1939, pp. 9, reprinted from *Verh. Akad. Wet. Amst.*, 1935, deel 42, No. 5.

*Freezia* hybrids often produce tubers that fail to start. Keeping the bulbs for 10 weeks at temperatures from 28°-20° C. resulted in all (48) sprouting; at 9° C. none sprouted. The varieties Daffodil and Buttercup require at least 9 weeks at 25.5° C. to guarantee sprouting. Early flowering of Daffodil was obtained by removing the tubers after 7 weeks from 25.5° C. to 13° C. With the variety Buttercup earliest flowering occurred after 9 weeks at 25.5° C. followed by 2 weeks at 9° C.

955. KLIMENKO, V. N. 635.944  
 New *Gladiolus* forms. [Russian.]  
*Soviet Subtropics*, 1939, No. 6 (58), pp. 44-7.

The best ten of the new Russian *Gladiolus* varieties grown at Batum are described.

956. GROVE, L. C. 635.944  
 Growth and flowering of the gladiolus. Influence of certain morphological and physiological characteristics of the corms.  
*Res. Bull. Ia. agric. Exp. Stat.*, 253, 1939, pp. 112, bibl. 44.

Low-crowned corms in most cases completed their sprouting in less time than high-crowned corms. The differences ranged from 1 to 2.1 days. They produced  $1\frac{1}{4}$  to  $2\frac{1}{2}$  times greater leaf area and from 4 to 116% more flower spikes per corm. They also, in most cases, produced taller flower spikes (from 6 to 7.2 cm.) and from 1.4 to 15 more florets per corm. There was no consistent difference in the number of florets per spike or in width of florets or in the average number of days in which flowering was completed as between low and high-crowned corms. Shape of corm did not indicate its flowering potentiality. Chemical composition, which was examined throughout growth, showed considerable differences between low and high-crowned corms.

957. HARTSEMA, A. M., AND WATERSCHOOT, H. F. 635.944 : 635.952.2  
 De begrensde mogelijkheid van hyacinthen-bloei in de tropen. (*Flowering hyacinths, tulips and daffodils in the tropics.*) [English summary.]  
*Meded. Lab. PlPhysiol. Wageningen* 61, 1939, pp. 27, bibl. 11, reprinted from *Meded. LandbHoogeschool. Wageningen*, deel 43.

In 1929 the possibility of exporting Dutch bulbs in small quantities to the tropics with the certainty that they would flower at any rate once after arrival was first investigated. A stage has now been reached when definite pronouncements on the conditions necessary can be made. *Hyacinths.* The best variety is L'Innocence (white). The bulbs must be kept and shipped at 2°-4° C. within six months of digging. A brisk drying at 32°-34° C. for a few days immediately after lifting is advised for bulbs going to the southern hemisphere. On removal from cold the bulbs must be kept at 26° C. for 8-12 weeks before planting; during this period flower-formation takes place. The temperature at planting must be 13°-18° C. and the work can, therefore, only be done in cold store or in the mountains at over 4,500 ft. (in easily portable boxes). Bulbs planted at 13° C. may be brought into the normal tropical climate when the nose is just over an inch long but if planted at 18° C. they must wait until the nose length is 4 inches. *Hyacinth* bulbs can also be shipped without cold storage in uncooled holds directly after digging, or after flower initiation has been accomplished, at a temperature of 25°-28° C. In either case the bulbs must be planted at latest 4 months after digging, the planting conditions being as already outlined. Instructions are given for producing Christmas blooms. *Tulips.* These bulbs can be shipped immediately after digging, at from 0°-4° C. after a preliminary few days drying at 32-34° C. or they may be stored before shipping at -1°-0° C. and shipped at ± 0° C. On arrival in the tropics tulip bulbs must be kept for 10-12 weeks at 18°-25° C. (flower initiation), then planted at 9°-13° C. and flowered at 17°-20° C. This last is the highest temperature at which imported tulip bulbs can be made to flower. *Daffodils.* King Alfred is suggested as one suitable variety. The bulbs can be shipped after digging, in uncooled conditions but below the waterline or may be stored before shipment for a considerable time at 28°-31° C. On arrival in the tropics they can be planted at once, preferably at 9°-13° C. Like tulips they cannot be flowered satisfactorily above 20° C.

958. HAASIS, F. A. 635.944 : 632.8  
**Studies on narcissus mosaic.**

*Mem. Cornell agric. Exp. Stat.*, 224, 1939, pp. 22, bibl. 36.

The narcissus mosaic disease, its cause, transmission and symptoms are discussed. Symptom expression of mosaic among narcissus varieties varies greatly, but inter-varietal inoculations indicate that the disease is likely to be caused by a single virus. Plants other than narcissi appear to be highly resistant or immune to infection. Control measures consist of roguing and destruction of mosaic-diseased plants and of protecting healthy plants from inoculation by means of fine-mesh cheesecloth cages. Neither hot water nor hot vapour treatment proved of any use

959. LATTA, R. 635.944 : 632.6/7  
**Vapor-heat treatment for the control of narcissus bulb pests in the Pacific North-west.**

*Tech. Bull. U.S. Dep. Agric.*, 672, 1939, pp. 54, bibl. 8.

Experiments carried out at Sumner, Wash., showed that 110 to 111° F. was the most favourable temperature for hot vapour treatments of narcissus bulbs against pests. The minimum durations at this temperature necessary for complete mortality of the pests were determined as follows:—  
 1. *Merodon equestris*, 1½ hours; 2. *Eumerus tuberculatus*, *E. strigatus* and *E. narcissi*, 1½ hours; 3. *Tarsonemus approximatus* var. *narcissi*, ½ hour; 4. *Rhizoglyphus hyacinthi*, ½ hour. Moreover, almost complete control of the bulb nematode (*Ditylenchus dipsaci*) has been obtained by 8 hour treatments at 110° to 111° F. during the earlier part of the storage season.

960. DE MOL, W. E. 635.944  
 Genetische und morphologische Studien an "Fringed"- und "Parrot"-Tulpen. (Genetical and morphological studies on fringed and on parrot tulips.)  
*Gartenbauwiss.* 1939, 13 : 212-34, bibl. 5.

TOMPKINS, C. M. 635.936.832 : 632.8  
**Two mosaic diseases of annual stock.**  
*J. agric. Res.*, 1939, 58 : 63-77, bibl. 13.  
 Transmitted by aphids.

## CITRUS AND SUB-TROPICALS.

961. TANAKA, T. 634.3 + 634.451  
**Achievements in horticultural research in Japan.**  
*Philipp. Agric.*, 1938, 27 : 437-44.

The achievements discussed in detail are mainly in connexion with those improvements of citrus in which the author has played a part. There are some notes on scion influence which, it is claimed, can be very pronounced. The behaviour of trifoliate stock, *Poncirus trifoliata*, is cited. This variety when ungrafted never grows more than bush size, yet when used as a stock it develops its stem greatly, and however thick the scion stem becomes the trifoliate portion will always overgrow it. With sweet orange scions the trifoliate stock becomes deep rooted with the laterals descending at a steep angle; lemon scions, however, cause shallow rooting with the laterals descending at a wide angle, and the roots are a lighter colour. A degree of hardiness has been imparted to grapefruit by using the Unshiu (Satsuma) orange as an intermediate on trifoliate stock. In the Japanese persimmon when *Diospyros Kaki* is the stock, different varieties of this persimmon also affect the angle of descent of its roots.

962. BENEMERITO, A. N. 634.31  
**The sour and sweet oranges of Kwangtung, China.**  
*Philipp. J. Agric.*, 1938, 27 : 302-41, bibl. 44.

An account with botanical descriptions of a number of varieties of orange grown in the important citrus producing province of Kwangtung, China.

963. UPHOF, J. C. T. 634.31 : 581.145.2  
 Wissenschaftliche Beobachtungen und Versuche an Agrumen. X. Die Entwicklung der superfoetalen Früchte an der Washington Navel Apfelsine. (Notes and experiments on citrus varieties. X. The development of the secondary fruit in the Washington Navel orange.)  
*Gartenbauwiss.*, 1939, 13 : 184-93, bibl. 15.

The author traces with sketches and photographs the development of the navel fruit in the Washington Navel orange.

964. TORRES, J. P. 634.3-1.523  
**Results of citrus hybridization in the Philippines.**  
*Philipp. J. Agric.*, 1938, 9 : 161-76, bibl. 6.

The results of citrus hybridization at the plant breeding station, Manila, from 1929-36 are presented. Cross-compatibility between varieties of the same species is general but in inter-specific hybridization cross-incompatibility is fairly frequent. The cross-incompatibles are named.

965. PERLBERGER, J., AND REICHERT, I. 634.3 : 581.175.11  
**Experiments on albinism in citrus seedlings.**  
*Palestine J. Bot., R. Ser.*, 1938, 2 : 40-77, bibl. 16, being *Bull. agric. Res. Stat., Rehovot, Palestine*, 24.

Considerable losses from albinism occur from time to time among citrus seedlings in nurseries

in Palestine. Dipping citrus seeds in disinfectant solutions of Upsulun, Cerasan or Germisan or dusting with Abavit eliminated or reduced this trouble. The methods used are described. The appearance of albinism could not be connected with any environmental conditions or with size, degree of maturity of fruit and seeds or their place of origin or with any particular parent tree. In the laboratory albinism was controlled by dipping the seeds in salt solutions of mercury, copper, lead, cobalt and nickel, but salts of iron, zinc, manganese, magnesium, calcium, strontium and barium were ineffective. From this it is argued that albinism in citrus seedlings is a constitutional property inherent in the plant, which manifests itself only at germination and is probably due to a disturbance of the enzymatic systems of the plant at this stage. This is borne out by the fact that salts of heavy metals which are known to have an effect on enzymatic systems cause citrus seeds to produce normal seedlings.

966. BOU BONO, B. 634.322 : 581.48  
 Observaciones sobre el número de semillas de la mandarina "Clementina".  
 (Remarks on the number of seeds in the Clementine mandarin.) [French summary.]

Reprinted from *Bol. Inst. Invest. agron. Madrid*, 1937, 3 : 195-207.

The investigations were undertaken at the Estacion Naranjera de Levante, Burjasot, Spain. The variable number of seeds in the Clementine mandarin is uninfluenced by the branch or tree. Seed contents were classified as many, few, or none. The fruits of a tree covered with muslin to prevent outside pollination were practically seedless. Flowers covered with paper bags did not fruit. The fruit of flowers fertilized with the few-seeded Cadena Fine variety contained few seeds. Flowers of Clementine fertilized with other flowers from the same tree gave fruit with seeds. The only conclusions drawn so far are that the number of seeds in a fruit of this variety is a phenomenon of fertilization.

967. MAURI, N. 634.3-1.541.11  
 Contribution à l'étude de la sélection du porte-greffe chez les agrumes.  
 (Rootstock selection in citrus.)

*Rev. Hort. Agric. Afr. N.*, 1938, 42 : 198-206.

On the assumption that in the polyembryonic seed of *Poncirus trifoliata* and *Citrus Bigaradia* the sexual embryo is visibly the strongest, it is suggested that a line of clonal plants (for rootstocks) can be obtained by eliminating the sexual plant as soon as germination starts and replanting the seed to continue development. The percentage of cases where the embryos are all of equal size rendering this operation impossible is 5% for trifoliolate and 10% for bigaradia. Although the work of removing the sexual germinating embryo requires some patience, it is not such a delicate operation as might be thought and is well within the capacity of anyone.

968. BATCHELOR, L. D., AND WEBBER, H. J. 634.334-1.541.11  
 Progress report of lemon rootstock experiments.  
*Calif. Citrogr.*, 1939, 24 : 160-1, 190-1.

The rootstock trials which are the subject of this progress report have been in existence since 1927 in California at the Riverside Experiment Station and elsewhere. The sweet orange stock has proved for the lemon to be superior to all others tried in promoting uniformity, size and yield. Sour orange and rough lemon are more adapted to light than to heavy soils. On sour orange roots on heavy soil the lemons used (Eureka and Lisbon) have been up to 50% affected with decline after the 12th year. On sandy soil decline is practically non-existent on sour stock, but on rough lemon it is more apparent. Mandarin orange and Sampson tangelo as stocks for lemon have shown resistance to gummosis and freedom from lemon decline. Possibly they are more suited to the heavier soils. Grapefruit stocks have been more variable and have resulted in lower yields than the other stocks.

969. ZORIN, F. M. 634.3-1.541.11

**The use of mentors in citrus selection.** [Russian.]

*Vernalization, Moscow, 1939, No. 1 (22), pp. 110-7.*

The use of Mitchurin's methods for changing the nature of hybrid plants at the Sochi research station for subtropical plants and southern fruits is described. The mentor effect is brought about in four different ways: 1. A strongly growing scion is worked on to the stem or crown of the young hybrid. 2. In addition the hybrid is worked on rootstocks of the same variety as was used for topworking (above). 3. Wood from the young hybrid is worked on a clonal rootstock of one of its parents. 4. From the scion variety which has already started to flower all its foliage is removed. This results in a complete change in the nutrition of the shoot, flowers and fruit, which are now fed entirely by the leaf and root system of the mentor rootstock.

970. BIALE, J. B. 634.334-1.535

**Transpiration of lemon cuttings in reference to leaf-root relationship.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 250-4, bibl. 2.*

Effect of leaf removal on transpiration of rooted lemon cuttings under constant environmental conditions was studied at the University of California. Differences of water loss greater than 10% were taken as due to treatment. Leaf removal from either end of the cutting produced similar rates of water loss. With root conditions non-limiting in relation to transpiration surfaces, comparisons in transpiration can be made on a leaf area basis. A range of values is suggested for leaf surface in square decimeters per gram of root weight above which water loss per unit area decreases with an increase of this ratio.

971. OPPENHEIMER, H. R., AND MENDEL, K. 634.31 : 581.144.4 : 581.11

**Orange leaf transpiration under orchard conditions.**

*Bull. agric. Res. Stat., Rehovot, 25, 1939, pp. 82, bibl. 81, also in Palestine J. Bot., R. Ser., 1938, Vol. 2, No. 2.*

The daily and yearly march of Jaffa orange leaf transpiration was studied in a typical Palestine orchard under optimal water conditions. The trees were on sweet lime stocks. The method adopted consisted in rapid weighings of detached single leaves with Huber's transpiration balance. The method and manner of taking the observations and their results are critically discussed. Transpiration losses steeply increased from sunrise to round about mid-day, then fluctuated until 3 or 4 hours before sunset, when a decided drop set in. Maximum values attained throughout the year depended largely on climatic conditions. In periods of great heat all the water in the leaf is expended every 24 minutes. Water comprises two-thirds of the weight of orange leaves. In the shade transpiration values were about half of those in the sun. In the sun in normal weather leaves lost 1.3-2.5 times their fresh weight per day in winter, 4.3-6.5 in spring, 6.5-9.6 in summer and 4.2-6.7 times in autumn, young leaves usually losing more than mature. Losses were appreciably higher on the lower side of the leaf. Although evaportations on sirocco days reached 60% above normal, transpiration losses were not much above normal. Stomatal regulation plays an important part in the mechanism of restriction of heavy water losses. Analyses of the fluctuation curves shows that the most important influences on transpiration are light intensity, insolation and atmospheric humidity, wind velocity being of less importance.

972. FURR, J. R., AND TAYLOR, C. A. 634.334-1.432 : 581.145.2

**Growth of lemon fruits in relation to moisture content of the soil.**

*Tech. Bull. U.S. Dep. Agric. 640, 1938, pp. 71, bibl. 19, 15 cents.*

The investigations recorded were undertaken in California to determine the response of lemon trees to variations in soil moisture conditions within the root zone, in the proportion of soil wetted and in the length of time between irrigations. Changes in apparent growth rate of lemon fruits were found to serve as an excellent index of the relative water deficit of the tree, turgor

deficit arising before the first visible sign of leaf wilting or any decrease in the transpiration rate occur. Root concentration and soil moisture extraction varied greatly in all orchards examined. The moisture content of regions of highest root concentration was reduced to wilting range (i.e. the period between the permanent wilt of basal leaves on well-established sunflower plants to the complete wilt of all leaves) before a water deficit was evident from fruit measurements. Before the moisture content of all the soil of any easily delineated zone, such as the top foot, had reached wilting range, appreciable parts of the soil had remained in wilting range for long periods and high water deficits had developed in the trees. It was possible when first water deficit developed in the fruit to find soil moisture contents varying from within wilting range to near field capacity. These variations in the most uniform orchards were great enough to render averages of soil moisture percentages unreliable as a measure of the water supply of the trees. In field experiments, if only one half the surface area was maintained with soil moisture above the wilting range, the trees received an ample water supply. Variability in root concentration prevented the determination by ordinary methods of soil sampling of the actual proportion of soil in the root zone that was reduced into the wilting range without causing severe water deficit or reduction in the final size of the fruit. The rate of extraction of water from one part of the soil in the root zone was influenced by the moisture content of the soil in other parts of the root zone. If water was applied only when apparent growth of fruit showed slight to moderate water deficit, the ultimate size of fruit was unaffected on heavy and medium soils but reduced on light soils. On plots of all three soil types water withheld until apparent growth of fruit ceased or leaves began to roll resulted in pronounced reduction of final fruit size, some loss of leaves and, on the light soil, in injury to small twigs. Fruit measurements should be used, not to predict when water should be applied, but to determine whether established practices are producing desired results. If fruit growth decreases materially before irrigation and increases sharply after irrigation, it is evidence that there was an appreciable water deficit prior to irrigation and the measure of this deficit may be gauged from the magnitude in the difference in growth rate just before and just after irrigation. [From authors' summary.]

973. TAYLOR, C. A. 634.3-1.67  
**Development of methods for thorough irrigation.**  
*Calif. Citrogr.*, 1938, 24 : 52.

A brief history is given of the changes in water conduction methods in the irrigation of citrus orchards in California. The system here advocated is one of straight, broad (20-24 inch bottoms), shallow furrows, 4 or 5 to each avenue, with an alteration of position of ridge and furrow in successive cultivations. The types of furrow suitable for this work are discussed and certain necessary requirements for their efficient working are pointed out, one of the most important being a proper mechanism for depth control, since every change in soil type or tilth requires a different weight and bearing relationship.

974. ANON. 634.3-1.67  
**Unique method of drainage devised by San Fernando grower.**  
*Calif. Citrogr.*, 1939, 24 : 120.

In an orchard in California, which it was impossible to drain in the ordinary way without running the water on to an orchard on a lower level, a new method was devised. At the 5 lowest points pits 2 feet in diameter were drilled to sand 35 feet below. The holes so made were filled with cement pipes in 3 ft. lengths standing one on top of the other but not cemented together. To these holes the drains were led. Instead of using the customary perforated tile pipes, trenches 4 feet deep with a 3% fall were dug. In the bottom of each trench a small trench, in depth the width of a shovel or 8 inches square, was made. The small trench was filled with stones 2 inches or so in diameter and covered with bean straw and farmyard manure. The large trenches were then filled in with soil. The trenches are connected with the drainage pits by 7 joints. The results are said to have restored the failing orchard to health.

975. ANON. 634.3-2.111

**Grower uses infra-red ray lamps for frost protection.**

*Calif. Citrogr.*, 1939, 24 : 159, 179.

In California lighting a lemon orchard of  $2\frac{1}{2}$  acres with infra-red, therapeutic 260 watt lamps with reflectors is claimed to have been successful in preventing frost damage with a recorded air temperature of  $23\cdot 5^{\circ}$  F. The lamps are strung on wires 12 feet above the centre of alternate rows. The spacing between lamps is 20 feet  $\times$  40 feet and they are staggered so that light covers every part of the tree. A total of 128 lights covers the area. The inventor of the system, which is on trial for the first time, now thinks that the height of the lamps should be 16 feet. Installation cost 160 dollars per acre including all labour and equipment. Another advantage claimed is that by lighting at the opportune moment the lemons can be prevented from ceasing to grow and turning "tree ripe" which they do when the temperature reaches  $38^{\circ}$  F.

976. CAMP, A. F., AND PEECH, M. 634.3-2.19

**Manganese deficiency in citrus in Florida.**

*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 81-5, bibl. 6.

Manganese deficiency symptoms on citrus as they occur in the field in Florida were found to resemble the symptoms of zinc deficiency as to leaf pattern but much less pronounced. It can be corrected by applications of manganese salts both to the soil and to the leaves. [From authors' summary.]

977. CARRANTE, V. 634.31-2.19

**La "fetola" delle arance e dei mandarini. (The fetola disease of oranges and mandarins.)**

*Boll. Staz. sper. Acireale* 71, 1938, pp. 7.

Fetola is a disfiguring disorder on the fruits of oranges and mandarins, consisting of small discoloured areas on the skin varying in size from a few mm. to 15-20 mm., and not going deeper than 0.5 mm. A feature of the trouble is the mortification and disintegration of the inter-glandular cells. The oil glands remain undisturbed, but become denser and turgid and somewhat prominent in comparison with the disordered tissues. Generally speaking, after harvest the affected areas do not spread or become darker, but after about a fortnight under humid conditions they tend to become more obvious and disfiguring to the fruit. In Sicily investigations indicate that the essential causes are seasonal and climatic, namely heavy dew, hoar frost, radiation and sudden large changes in temperature and that the effect of these are aggravated by faults in irrigation such as lack of adequate drainage, by insufficient pruning to ensure proper aeration of the tops of the trees, and by too close planting. Attention should also be paid to careful picking so as not to aggravate the condition. Finally it is suggested that after picking and before washing in hot water oranges and mandarins subject to the phenomenon should first be stacked in store houses for 2 or 3 days, both to ripen a trifle and to avoid the sudden change of temperature which they will otherwise experience on immersion in the hot bath.

978. CARRANTE, V. 634.334-2.19

**Il mal secco dei limoni e i mezzi di lotta più consigliabili allo stato attuale delle conoscenze. (Mal secco of lemons and the best available methods of dealing with it.)**

*Boll. Staz. sper. Acireale* 70, 1938, pp. 32.

The author gives a clear account of the onset and increasing attacks of mal secco in lemon groves and considers proposals made for dealing with it. It is caused in the first place by *Deuterophoma tracheiphila* Petri. This only seldom results in speedy death due to the intervention of other parasites, and more often gives rise to a slow but obvious decline. The nature of the parasite makes control extremely difficult and the only advice which can at present be given is either to scrap lemons in favour of such other crops as peaches or replant the orchard first with sour orange seedlings worked with sweet orange (the latter being resistant) and then with some, as yet undiscovered, variety of lemon which will combine resistance to mal secco with such good

commercial qualities as are not possessed by the only lemon variety offering good resistance at present, i.e. the Monachello. The latter is, incidentally, incompatible with the sour orange and is not a heavy cropper.

979. FAWCETT, H. S. 634.3-2.8  
**Scaly bark in relation to propagation of citrus trees.**  
*Calif. Citrogr.*, 1939, 24 : 242, 262.

It is shown that scaly bark (psoriasis) of citrus is probably a virus disease transmissible by buds, bark grafts and root grafts. So far no mechanical means have succeeded in transmitting the disease nor has an insect vector been found. In almost every case the grafts from disease-free parents have remained disease-free, while the grafts of infected parents have always resulted in an infected tree. The disease may not appear on the bark for twelve years or so, nevertheless, it has been latent in the tree since the time of the tree's propagation. To check the spread of the disease the Department of Agriculture of California has originated a system whereby psoriasis-free trees suitable for the provision of scions are labelled and recorded. Before such a tree is passed as fit it must be at least 15 years old without bark or leaf symptoms. It must not be in proximity to any tree showing psoriasis. In the case of lemons 10 buds from each tree to be registered must be inserted in at least five separate sweet orange stocks: the leaf growth from these and from shoots from the stock itself are examined for the disease after the buds have grown out. The system is not compulsory, but nursery trees from these parents may be sold as coming from registered trees.

980. KONSTANTINOV, M. K. 633/5  
**Report of the Sukhum Introduction Nursery.** [Russian.]  
*Soviet Subtropics*, 1939, No. 5 (57), pp. 17-22.

Among projects in progress the following may be noted. *Citrus*. As a result of varietal tests and breeding for hardiness, early maturity and fine quality fruit, some 25 varieties of lemon, orange, grapefruit and mandarin have been selected and are now being propagated on a large scale. A large stock of American, Italian and Japanese plant material is still under investigation. For lemons, which are particularly susceptible to frost and which need shelter and heating in winter, an original method of cultivation has been worked out by N. V. Ryndin. It consists of grafting lemon scions to the framework of the mandarin trees and of leaving the trees unsheltered in winter. Three years after the grafts are made trees bear two crops, namely, lemons and mandarins. Hence, if after a severe winter the lemons fail, there still remains the mandarin crop. *Japanese persimmon*. A great number of fine and hardy varieties were tested and 10 of them are now recommended for planting. *Tung tree*. A number of hardy hybrids with shorter growth periods have been produced. *Medicinal plants and spices*. Methods of growing cinchona and certain other tropical and subtropical plants as annuals has proved successful and now the cultivation of these plants is possible in spite of the cold in winter. *Green crop manures*. As a result of a 4-years' study all the best green crop manures for the principal subtropical crops on the main soil types of the humid subtropics are known, and the seeds for such green crops can be obtained from the Sukhum Nursery. *Growth stimulants*. Colchicine and heteroauxin have been prepared synthetically.

981. GISCARD, R. 633.85  
**La culture de l'aleurite au Maroc. (Cultivation of aleurites in Morocco.)**  
*Bull. Inst. colon. Marseille. Mat. grasses*, 1939, 23 : 4-7, being notes from article in *La Terre marocaine*, Dec. 1938.

Species of *Aleurites* were first experimentally planted in various parts of Morocco in 1926. Of these *A. Fordii* has shown to best advantage. It requires certain attentions, however, such as the provision of windbreaks and irrigation, and it has not fulfilled the hopes at first entertained that it would succeed on poor or ill-drained soils. (See also abstract 982.) Only a few plantations have really done well and they are all situated in a narrow strip of territory

25-40 kilometres inland from Tiflet to Boulhaut. Apart from any benefits accorded by the locality these plantations have also been intelligently and expensively cultivated. The quality of the oil is excellent but even so profitable production is not assured. There is no local factory, the small quantity of nuts scarcely justifying one, and the nuts have to be sent to America.

982. BURNS, M. M., TAYLOR, N. H., DIXON, J. K., AND HODGSON, L. 633.85  
**A survey of tung groves in New Zealand.**  
*Bull. Dep. sci. industr. Res. N.Z.*, **66**, 1939, pp. 61. bibl. 14, being *Soil Survey Division Publ.* **2**.

The climatic conditions in New Zealand most suitable to *Aleurites Fordii* are discussed and compared with those in the natural home of the tree in China, the chief difference being in the more equable New Zealand temperature. It is certain that so far *Aleurites Fordii* has not done particularly well, but the suggestion that some other species might do better is rejected. The soil on which most of the tung trees in New Zealand are growing is impoverished. The choice of such unsuitable sites as they have proved to be is attributed to erroneous information sent out from the United States during the early years after the establishment of tung groves in Florida. The best trees in New Zealand are planted on a small alluvial terrace. There is a definite correlation between the type of root system produced and the soil type upon which the trees are growing. The existing tung groves are underplanted with 60-70 trees per acre. This could be increased to 120 trees per acre if it were worth while to continue planting. Various suggestions for the improvement of the plantations are put forward, but the authors are pessimistic. It is unfortunate that in New Zealand there is no grove established on highly fertile land to serve as a check, particularly as these are the conditions under which the tree thrives in other countries. Any further extension of acreage in New Zealand should be confined to experimental plots on freely permeable fertile soils. The present troubles are attributed to (1) the selection of unfavourable grove sites upon ill-prepared impoverished soil, characterized in part by undesirable physical conditions; (2) the planting of trees upon exposed slopes; (3) the use without discrimination of all nursery stock grown. There is an appendix containing extracts from American reports of the tung oil industry in that country. These indicate that even there failures are more frequent than successes and that "money put into it by the average person is still a speculation and not an investment".

983. TOXOPEUS, H. J., FERWERDA, F. P., AND HUITEMA, W. K. 633.85  
 Richtlijnen voor de selectie van *Aleurites*. (**Directions for selection of Aleurites.**)  
*Landbouw*, 1939, **15** : 43-6.

A self-pollinated *Aleurites montana* in Java produced a series of very uniform and robust seedlings. The same tree cross pollinated with an inferior male produced a very uneven progeny. A photograph containing several rows of both types growing side by side shows the remarkable differences very clearly. Selection should aim at producing robust high yielding trees, which owing to the heterogeneity of normally pollinated seedlings is best done at present through vegetative propagation. The second objective to be achieved, probably by breeding, is to secure clones combining high yield with high oil content. The two in nature by no means certainly go together.

984. WIT, F. 633.85  
 Het botanisch onderzoek van *Aleurites*. (**Botanical investigation of Aleurites.**)  
*Landbouw*, 1939, **15** : 9-27, bibl. 6.

Brief notes are given of the various species of *Aleurites*. The morphological differences between *A. Fordii* and *A. montana* are described. For reasons stated *A. Fordii* is considered unsuited to the climate of Java and the remainder of the paper deals only with *A. montana*, of which the various vegetative and floral processes are discussed.

985. HUIITEMA, W. K., AND FERWERDA, F. P. 633.85  
 De cultuur van den houtolieboom. (The cultivation of the tung oil tree.)  
*Landbouw*, 1939 **15** : 28-42, bibl. 18.

The cultivation of *Aleurites Fordii* and *A. montana* in various countries is discussed shortly. The cultivation of *A. montana* in the Dutch East Indies is described fully, though with such a new crop much experience still remains to be gained. The seed quickly loses viability. To ensure rapid germination the shell is filed till the white pericarp is visible, but no further or the seed will rot. In experiments after one month filed seed has germinated 80% and unfiled only 5%. The seeds germinate best in sterilized moist sawdust in which they are placed with the flat side downwards and covered to a depth of 1½ cm. with sawdust pressed firmly down. Shading is undesirable except perhaps from 11 a.m. to 3 p.m. on hot days. Careful watering to maintain the requisite moisture in the sawdust is necessary. As soon as the cotyledons appear above ground the seedlings are transplanted to baskets (preferable) where they remain for 3 or 4 months by which time they should be 30-40 cm. high, or to nursery beds. Deep planting will reduce insect attack. Shade is removed as soon as the plants have settled down. In planting out basket plants are put out as they are, except for the removal or, if this cannot be accomplished without root damage, the cutting open of the basket to avoid root constriction. Nursery plants have to be stumped and are put out at 10 months. *Aleurites montana* is easily budded on nursery seedling stocks usually a year old, on suckers of cut back trees or on lateral branches of trees in growth. There appears to be no pronounced polarity, so that budwood can be taken from lateral or leader. The modified Forkert\* method of budding is used and 100% successes are quite usual. The tie is opened in 15-20 days and the top is cut back after a further similar period about 15 cm. above the bud. The budded plants can be transplanted either with dormant or swelling buds, the latter stage being reached about 2 weeks after the removal of the stock top. The bud is inserted on a part of the stock where the bark is still green. Budded plants make dwarfer trees with heavier branches. So far *montana* has been the safest stock to use. With *A. moluccana* an apparently sound union is made but the plants die off after planting out while undisturbed buddings perish after the stock is cut back. The plantations are unshaded. A deep-rooting cover crop of some sort is necessary for soil conservation. *Indigofera hendecaphylla* is suggested. It must be cut down before harvest since much of the crop is gathered by collecting the fallen nuts. Planting distance for *Aleurites* is about 4 metres or 160-200 trees per hectare, but until uniformity of yield is assured through efficient selection methods a preliminary plantation of 400 per hectare with subsequent selective thinning to the required density is regarded as the best method of securing the highest yield. This applies to seed-grown plants only. Seventy-five per cent. of the crop is borne in the second half of the year with the maximum in August to October.

986. MULLER, H. R. A. 633.85-2.4  
 Aanteekeningen over eenige ziekten van *Aleurites montana* Wils. (Some  
 diseases of *Aleurites montana* Wils.)  
*Landbouw*, 1939, **15** : 54-68, bibl. 14.

Root diseases are mainly those which also attack *Hevea*, a fact of some importance, when the planting up of former rubber ground with tung oil is under consideration. Eight of these are discussed. Leaf and shoot diseases which do not completely kill the tree are caused by *Corticium salmonicolor*, by *Glocosporium aleuriticum* and by *Botryodiplodia Theobromae*—also cited as attacking the roots. In the two last cases the attacks usually occur on sickly trees. Physiological disturbances are due to zinc deficiency, indicated by bronzing of the older leaves and malformation of the young; a copious gumming sometimes occurs, principally on the east side of the trees. This is the side on which the moisture of dew and night rains evaporates late. The connexion is suspected but not established. The injury arises chiefly from the entrance of secondary organisms such as *Botryodiplodia* into wounds. *Aleurites* seems on the whole

\* For description and illustration see Technical Communication No. 7 Vegetative propagation of tropical and subtropical fruits. Imperial Bureau of Horticulture and Plantation Crops, East Malling, pp. 8-9.

rather susceptible to certain disorders of fungal origin in its early life, particularly when it is weakened from transplanting or other drastic operation.

987. FRANSSEN, C. J. H. 633.85-2.7  
 De dierlijke beschadigingen van *Aleurites montana* Wils. (Pests injurious to *Aleurites montana* Wils.)  
*Landbouw*, 1939, 15 : 47-53, bibl. 4.

This claims to be the first study made, at any rate in Java, of the pests attacking the tung oil tree. Those dealt with are:—On germinating seeds, a small white fly (*Phoridae*) ; on the roots, termites ; on stems and branches, a bark beetle (*Platypodidae*) and a lepidopterous borer (*Heptialidae*, probably *Phassus damor* Moore) ; on leaves, a large green grasshopper (probably *Patanga rosea* Burm.) a leaf miner at present unrecognized, two weevils (*Dermatodes aeruginosus* Gyll and *Myllocerus* sp.), a cockchafer (*Rutelidae*), a tussock moth larva (*Euproctis minor* Sn.), a slug caterpillar (*Setora nitens* Sn.), a looper caterpillar (*Hyposidra talaca* Wlk.), a bagworm (*Psychidae*) and a mite (*Tarsonemus translucens* Green) ; on flowers, chafers (*Macronota regia* F. var. *pallida* Sch. and *Glyciphana pygmaea* Mohn.), a click beetle (*Melanoxanthus fractus* Cand.) ; on fruit, a shield bug (*Chrysocoris atricapilla* Guér.). None appears to be dangerous at present.

988. RZHEVKIN, A. A. 634.63  
 Crimean olives. [Russian, English summary 14 lines.]  
*Soviet Subtropics*, 1939, No. 6 (58), pp. 37-1.

As a result of the study of the Crimean olive varieties for oil production, 3 particularly fine varieties have been singled out by the Nikita Botanical Garden. These are the Crimean 172, the Nikitsky I and Nikitsky II.

989. MORETTINI, A. 634.63 : 581.145.1  
 Ricerche sulla biologia fiorale dell'olivo. (Investigations on the floral biology of the olive.) [Summaries in English and German.]  
 Reprinted from *Nuovo G. bot. ital.*, 1939, 46 : 1-70, bibl. 45.

Contrary to popular belief the author found that nearly all the 8 olive varieties examined by him in the Provinces of Florence and Perugia are self-sterile, Frantoio being the sole exception. No inter-sterility between varieties was determined, but the author makes suggestions for appropriate inter-planting. Ovary abortion is found to occur frequently in two of the varieties tested, named Morchiaio and Olivo di seme. The author was also unable to confirm the current belief that ovary abortion, when it occurs, greatly influences yield.

990. EBEL, M. 634.451  
 Les kakis. (The kaki.)  
*Rev. Hort. Agric. Afr. N.*, 1938, 42 : 232-8.

An account of the kaki (*Diospyros* spp.) with reference to its cultivation in N. Africa. A number of Japanese varieties are described. These withstand cold better than the Chinese sorts. Propagation is best done by grafting on *Diospyros Lotus* or *D. virginiana* in spring or autumn. Spring is preferable but has the slight disadvantage that the scions often start to grow before the stocks. The unions should be well waxed. Shield budding is successful in July and August. In making the incision care should be taken not to bruise the bark, since buds often fail to thrive for this reason. The rapid growth of the bud, 4 feet in a season, makes some support necessary.

991. MORETTINI, A. 634.451  
 La coltura dei diospiri o cachi. (The cultivation of kaki in Italy.)  
 Reprinted from *Riv. Soc. tosc. Ort.*, 1939, May 30, pp. 8, bibl. 7.

The types of kaki grown in Italy are some ten astringent varieties of the *D. Kaki* L. type. They are all late varieties, which would ripen on the tree in Italy in November or December, and are actually picked previously at the end of October. The varieties are worked on hardy seedling *D. Kaki* or *D. virginiana* or *D. Lotus*, the last being preferred in Italy as rooting more

easily and hence transplanting better from the nursery. The seeds are separated from the fruit in November and stratified in sand until the end of February or March, when they are sown. In the following spring the seedlings are transplanted for budding in August or cleft grafting the following spring. They are transplanted again a year after grafting. They are trained goblet fashion as bushes or half standards at 5×7 metres apart. They are pruned moderately each year. Fruiting starts 3-4 years from planting. A plant of medium size will yield 50-120 kg. of fruit a year. The fruits are picked in October, before they split in half, and will then ripen gradually at room temperature through November and December. By cold storage they can be kept till February. The splitting can be advanced by ethylene treatment for 15-24 hours. The fruit contains 13 to 19% sugar in the form of glucose.

992. CAMERON, S. H., AND BORST, G.  
**Starch in the avocado tree.**

634.653 : 581.192

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 255-8, bibl. 6.*

The study forms part of the authors' investigations at the University of California on the irregular bearing of certain avocado varieties. Observations indicate that the periods of maximum and minimum starch content in the avocado fluctuate from season to season, depending upon environmental conditions, size of crop and time of harvest. Seasonal changes in starch content were gradual in all parts of the tree. Readily detectable quantities of starch were present, particularly in the primary xylem throughout the minimum period, thus differing from the orange where frequently only a few scattered starch grains can be found. The roots contain relatively more starch at all times than branches of similar diameter.

993. MIÈGE, E.  
La ramie et sa culture au Maroc. (**Cultivation of ramie in Morocco.**)  
*Rev. Bot. appl., 1939, 19 : 278-83.*

Two varieties of ramie are grown in Morocco, *Boehmeria utilis* Dec. and *B. nivea* Hook. Apart from the fibre obtained from the stems the leaves can be fed to cattle and the débris from decortication used as manure. *Boehmeria* requires moisture and warmth, *B. nivea*, however, will withstand a temperature of 6° C., with but slight burning of the leaves and some retardation of growth. Deep, light soils suit the plant best. Impermeable subsoils are to be avoided and any traces of salt either in the ground or in the irrigation water is resented; in fact this excessive sensitivity is a serious obstacle to the spread of ramie cultivation in Africa. The usual methods of propagation are by rhizomes or seeds. A clump of ramie two or three years old will produce about 12 plantable rhizomes. Planting density is 50,000 per hectare or spaced 75-80 cm. between the rows and 25 cm. in the row. Propagation by seed requires a full share of the care usually bestowed on varieties of capricious germination. At one month the seedlings are topped, at two months they are pricked out and at four months planted out. One kilogramme of seed will provide plants for 1 hectare. Before planting the soil must be worked to 50-60 cm. The dense growth of a healthy plantation will keep down all weeds except couch and *Cyperus*. In Morocco irrigation is given every 10-15 days from May to November at the rate of 10,000 cubic metres per ha. per annum. Cultivation by hoeing is done soon after irrigation. Water is withheld some time before each cutting or the moisture in the stem will adversely affect decortication. The finest and best fibre comes from stems harvested when the lower stems are darkening. The cut is made 10-15 cm. above the ground. Manuring is essential after the final cutting. That used in Morocco is cattle or some other organic, about 30,000 kg. per ha., to which is added sulphate of potash 250 kg., and superphosphate 250 kg. After each cutting during the season nitro-chalk or some similar manure is given at the rate of 100 kg. per ha. A plantation lasts about 12 years, and should yield 300 tons of green material per ha. per annum or from 2-3½ tons of fibre. In Morocco pests and diseases are negligible. There are indications that for Morocco ramie as a crop will never be of more than secondary importance.

994. PAL, B. P. 633.71-1.531

**A brief note on the seed supply of Virginia tobacco.**

*Agric. Live-Stk. India, 1939, 9 : 42-3.*

It is argued that there is no foundation for the belief that the seed supply of Virginian tobacco in India must be renewed from time to time by importation from America. Harrison's Special and Adcock have been grown in India for some years from locally saved seed with no sign of deterioration. It is of course necessary to guard against cross pollination with other varieties.

995. MOMOT, K. G. 633.95

**The camphor tree.** [Russian, English summary.]

*Trud. Intro. Nurs. subtr. Cult. 9, 1938, pp. 70, bibl. 64.*

The camphor tree [*Cinnamomum Camphora*] is being tentatively introduced into the Russian subtropics. An experimental plantation of 12 hectares of a shrubby form has been made. In this form the tree has proved hardier than the mandarin orange. The yield from 1 hectare of 2 cuttings totals about 200 kg. of camphor. Where it is hardy the camphor has proved an excellent windbreak. It is suggested that it could be extensively used for the purpose and that the leaves would be annually available for camphor extraction. The need for careful selection of seed is stressed in view of there being a camphor-free strain which is freely mixed with the camphor-yielding strain. The two can be distinguished when transplanting by the odour of leaves rubbed in the hand. Hybrids between a camphor-bearing strain, *C. Camphora* and *C. glanduliferum* show that the camphor bearing and the morphologic characters of the camphor tree are dominant, but when the 2 physiological races (camphor-yielding and camphor-free) of *C. Camphora* are crossed, the majority of the resulting seedlings are camphor-free. Two camphor-free *C. Camphora*, artificially self-pollinated, produced a mixture of seedlings of both types. Although vegetative propagation is difficult, *C. Camphora* can be successfully layered.

996. MILNER, E. M. 633.913

**Rubber plants in U.S.S.R.** [Russian.]

*Soviet Subtropics, 1939, No. 8(60), pp. 34-41.*

Among the exhibits at the agricultural exhibition in Moscow are the best ecological forms of 5-year-old tau-saghyz plants; 1-year-old tau-saghyz plants; 1 and 2-year-old kok-saghyz and 1-year-old krym-saghyz plants as well as spindle tree forms also producing rubber.

997. ZHIGAREVICH, I. 634.574-1.541 +1.541.5

**Vegetative propagation of the pistachio.** [Russian, English summary 7 lines.]

*Soviet Subtropics, 1939, No. 6(58), pp. 27-30.*

Vegetative propagation trials carried out with pistachio at the Azerbaijan research station led to the following conclusions. 1. The best time for grafting under Apsheron conditions was at the time of the second (autumnal) growth, i.e. from the end of July to mid-August. 2. Shield budding, with the wood removed from the shields, on shoots of the current year gave the best results. 3. Microscopic examinations showed that the removal of the wood from the shields resulted in a better and quicker union between stock (*Pistacia mutica*) and scion (*P. vera*). 4. Early August budding gave 90-100% take. The scions developed well and produced healthy woody shoots averaging 29-45 cm. 5. Other methods and other dates for budding gave very poor results.

998. SCARONE, F. 634.574

Remarques sur les améliorations à apporter à la culture du pistachier.

(**Improvement of pistache cultivation.**)

*Rev. Bot. appl., 1939, 19 : 415-20, bibl. 2.*

The reasons for the small progress made in the cultivation of the pistache (*Pistacia* sp.) as a commercial crop in the Mediterranean region are discussed. These are both economic, mainly lack of an adequate market, and horticultural. Among the latter are difficulties attending cultivation, such as the need for precaution to ensure pollination on account of the plant being

dioecious, the need for grafting and slow development of the grafts, the rapid loss of viability in the seeds, to mention a few. Attempts to solve the pollination problem by grafting male scions among the branches of female trees are often nullified by a lack of pollen compatibility or difference in time of flowering. Cultural needs of the pistache are those of the olive, but its resistance to cold is greater. Methods of cultivation in Sicily, Greece, Syria and California are briefly described. American methods have been carefully worked out and particular success has been achieved in the production of efficient pollinators.

999. TOMLINSON, F. R. 634.58

**The economics of peanut and maize production on the Springbok Flats.**

*Bull. Dep. Agric. S. Afr.* 196, being *Economic Series* 27, 1938, pp. 152, 1s.

This is an economic survey of the general organization of peanut and maize farms on the Springbok Flats, of the combination of the peanut enterprise with other enterprises and of the economics of peanut production.

1000. ZEMLINSKY, S. E. 633.88 + 632.951

***Anabasis aphylla* L. [Russian.]**

*Soviet Subtropics*, 1939, No. 8(60), pp. 43-4.

Among the medicinal plants exhibited in Moscow is anabasis (*Anabasis aphylla* L.) which grows wild in Southern Kazakh S.S.R. Green shoots of this plant contain anabazine (an isomer of nicotine) which is used in the manufacture of insecticides. Methyl-anabazine, which is a derivative of anabazine, was found to have a stimulating effect on respiration and promises to prove useful in medicine.

1001. STREETS, R. B., AND STANLEY, E. B. 632.954

**Control of mesquite and noxious shrubs on Southern Arizona grassland ranges.**

*Tech. Bull. Ariz. agric. Exp. Stat.* 74, 1938, pp. 469-97, bibl. 9.

The work reported here was done by the Arizona Experiment Station, but is to be continued by the Forest Service. Materials tested for their usefulness in the eradication of velvet mesquite (*Prosopis velutina*), a shrubby tree which is tending to spread in grasslands in Arizona and Texas, were sodium arsenite, white arsenic, acid-arsenic, sulphuric acid sprays, petroleum oils, sodium thiocyanate and ammonium sulphide. The method found entirely successful was to apply sodium arsenite to the sapwood by frilling the base of the stump or tree with downward strokes of an axe and inserting the poison [no definite quantity laid down—Ed.]. Broadcast burning proved to be the most effective method of dealing with burroweed (*Aplopappus fruticosus*) and snakeweed (*Gutierrezia Sarothrae*).

**TROPICAL CROPS.**

1002. CEYLON, DEPARTMENT OF AGRICULTURE. 632.97

**Declared pests, diseases and weeds.**

*Leafl. Ceylon Dep. Agric.* 122, 1938, pp. 2, being *Plant Protection Regulations Leafl.* 1, and

**Summary of legislation and regulations regarding the import of plants into Ceylon for the purpose of preventing the introduction of weeds and of pests and diseases of cultivated plants.**

*Leafl. Ceylon Dep. Agric.* 151, pp. 4, being *Plant Protection Regulations Leafl.* 16.

These two leaflets deal generally with regulations framed to prevent the entry of dangerous pests and diseases into Ceylon. Separate leaflets deal with the particular pests or diseases, which are as follows:—shot hole borer of tea (*Xyleborus fornicatus*), black beetle of coconuts (*Oryctes rhinoceros*), red weevil of coconuts (*Rhynchophorus ferrugineus*), coconut caterpillar (*Nephantis serinopa*), bud rot of coconuts (*Bacillus coli* or *Phytophthora* sp.), bunchy top of

plantains, root weevil of plantains (*Cosmopolites sordidus*), stem weevil of plantains (*Odoiporus longicollis*), soft rot of betel (*Bacterium Betle*), water hyacinth (*Eichhornia crassipes*), tea tortrix (*Homona coffearia*), nettle grubs (*Limacodidae*), coffee berry borer (*Stephanoderes hampei*) and mildew of rubber (*Oidium heveae*).

1003. CEYLON DEPARTMENT OF AGRICULTURE. (PARSONS, T. H., SYLVA, K. J., AND PERERA, E.) 585.94

**Notes on orchid cultivation and on some orchids cultivated in Ceylon.**

*Bull. Ceylon Dep. Agric.* **94**, 1938, pp. 35.

The authors in the order named were responsible respectively for the following sections:—principles of culture; manures, diseases, pests and notes on individual orchids; note on one individual orchid, namely *Phalaenopsis amabilis*.

1004. VAN DER GIESSEN, C. 631.3  
Verbeterde landbouwwerktuigen voor den inlandschen landbouw. (**Improved implements for native agriculture.**) [English summary.]

*Landbouw*, 1938, **14** : 697-710.

A description accompanied by line drawings is given of a number of implements improved by the Agricultural Institute at Buitenzorg, Java, for the use of smallholders.

1005. CROUCHER, H. H., AND SWABEY, C. 631.459  
**Soil erosion and conservation in Jamaica.**

*Bull. Dep. Sci. Agric. Jamaica* **17**, 1938, pp. 20.

A consideration of the chief crops grown and the effect on erosion shows that bananas are kept under clean cultivation and possess roots which do little to hold the surface soil, but drains are generally necessary and when properly laid do much to prevent erosion. Where citrus is grown on hillsides the grass cover between the trees checks erosion. Coffee is fairly widely spaced and is normally kept clean cultivated. Erosion often proceeds uninterrupted. Yams and sweet potatoes grown on hillsides entail opening of the soil at the end of the dry season and consequently the danger of considerable erosion from the gullies which appear between the yam hills. Ginger is generally grown in conjunction with drains running straight down the hillside, which encourage erosion. General causes which encourage erosion in Jamaica include forking of the soil at the end of the dry season (see above under yams), improperly placed drains, clearing land by firing at the end of the dry season, short tenancies encouraging thriftlessness, lack of care in cutting and maintaining roads on hillsides. Among preventive measures discussed are the following:—forest reservation, contour drainage, cover cropping, strip cropping, mulching, prohibition of tree removal, and planting of special plants such as bamboos and khus-khus. How these measures can be achieved and progress made in 1937 are considered. The terms of the Forest Law of 1937 are given in detail.

1006. MASEFIELD, G. B. 631.875  
**Practical composting.**

*Trop. Agriculture, Trin.*, 1939, **16** : 99-100, bibl. 2.

It is pointed out that composting cannot be reduced to rule of thumb methods but that the system selected must be one suitable to the climatic conditions. Pits are best in dry conditions but where there is a heavy rainfall they fail. Heaps are suitable for wet conditions, in dry periods, however, decomposition may be entirely suspended and the material may even blow away. Pits with a floor sloping to a drainage channel have proved quite successful in a very wet season in Uganda. Heaps can be protected from evaporation during dry weather by a surface covering, such as palm leaves, while if the top is built sloping inwards to a central hollow such rain as falls will be caught and collected. Too small heaps or too frequent turning of the heap leads to excessive moisture loss. An example is given in which two heaps of 9 cwt. each of fresh material were respectively turned weekly and not at all. At the end of  $3\frac{1}{2}$  months the unturned heap weighed 8 cwt. and the turned heap only 3 cwt. Since the control of moisture

is the most important single factor for success in composting, a flexible system taking advantage of the weather conditions is essential. The breeding of flies in the compost heap is a nuisance and may be a danger to health. This can be controlled by regular turning of the edges of the compost where they breed to the centre where the heat should destroy them. A 10-day interval is necessary in the tropics to ensure the destruction of the common house fly, the length of time from the laying of the egg to the emergence of the fly being 12 days. The suitability for composting of various kinds of material is discussed and notes are given of the best way of treating the different kinds. If much earth has been included, as often occurs when weeds are used, beans may be grown on the heaps to assist rotting. Aeration of compacted masses may be obtained by placing ventilating tiles or lengths of bamboo under the heaps. The difficulty of obtaining results in composting experiments which will satisfy the statistician is acknowledged, but the author considers that for practical purposes hand and eye make adequate substitutes after a little experience. A greater number of field trials of different methods would be of much assistance to the practical man, though quite possibly accurate scientific results might be difficult to obtain. In estate practice the composter should work out his own methods and not follow blindly methods worked out for other localities and climates.

1007. STEHLÉ, H. 631.874  
*Les légumineuses améliorantes aux Antilles françaises. (Leguminous plants for cover crops and green manures in the French West Indies.)*  
*Agron. colon.*, 1938, 27 : 33-45.  
 Twenty leguminous plants cultivated or naturalized in the French West Indies and suitable for green manuring and cover cropping are described, with biological notes. A few others are named only.

1008. CHEESMAN, E. E. 633/635  
*The history of introduction of some well-known West Indian staples.*  
*Trop. Agriculture, Trin.*, 1939, 16 : 101-7, bibl. 11.  
 A reprint of an address delivered to the Trinidad and Tobago Historical Society. The history of the introduction of sugar-cane, citrus, bananas and coffee to the New World is traced. The most important additions to the world's vegetable resources resulting from the discovery of the New World were maize, cacao, rubber, tobacco, quinine, and fine cottons.

1009. CALINISAN, M. R. 633.522-2.48  
*Vascular diseases of abacá (Manila hemp) in Davao.*  
*Philipp. J. Agric.*, 1938, 9 : 153-60, bibl. 6.  
 A progress report on the investigation of a vascular disease of Manila hemp (*Musa textilis* Née) resembling Panama disease of bananas. The disease is associated with bacteria and a fungus very similar to *Fusarium oxysporum* Schlt. f.3. Wr. (*Fusarium cubense* E. F. Smith). The predominance of the presence of bacteria over fungus in diseased tissues is very marked. A weevil, *Odoiporus paganus* Uichanco, is also found associated with diseased plants. There are eleven plates.

1010. OCFEMIA, G. O., AND CELINO, M. S. 633.522-2.8  
*Transmission of abacá mosaic.*  
*Philipp. Agric.*, 1938, 27 : 593-98, bibl. 4.  
 The mosaic of Manila hemp (*Musa textilis* Née) was found in the Philippines to be transmitted by *Aphis gossypii* Glover and two other species of aphis not identified. It was also transmitted when the wounded surface of an infected plant was allowed to remain in contact with a healthy one.

1011. DUFOURNET, R. 633.584.9  
Le raphia de Madagascar.

*Agron. colon.*, 1938, **27** : 134-51, and 1939, **28** : 1-8, 43-54, 76-83.

The raphia palm (*Raphia pedunculata* Beauv.) is of great commercial importance to Madagascar both for export of its fibre and from the fact that every part of the palm has some special use among the native population. Nevertheless, years of exploitation without any attempt at replacement or cultivation have reduced the numbers of palms and the situation is rapidly becoming critical. Replanting can and should be carried out. The whole situation is examined in this article. Raphia requires an atmospheric humidity and fears drought more than excess moisture. Drying winds cause the foliage to yellow but prolonged sunshine does not disturb it. Raphia grows on a great many soil types, gneiss being the least favourable. Since permanent soil moisture is essential, it is found in greatest quantity near any water that is not brackish. Some soil analyses are given. The plant associations found with raphia are named but usually *Raphia* exists as a pure stand since its close growth and vigorous root system kill out all competitors. It can exist on a variety of soils for it creates its own environment as its population increases. How this occurs is explained. Seed germination is slow and irregular : 10 months after sowing it may be from 10-80%. Normally after 3 years a seedling plant may be considered as established ; in 4 years it is 5 ft. high, in 7 years it has reached 9 ft. and can be exploited ; at 18-23 years the palm flowers, ripens its seed and dies. Attempts are now being made by the Administration to re-establish the palm. Experimental trials have shown that germination of seed is fairly rapid in light soil ; seeds watered daily germinate better than those under continuous irrigation ; shade assists germination ; given districts have optimum times of year for sowing ; naturally sown seed seldom germinates more than 5% ; nursery sown seed germinates 10% on the average ; seeds with the pericarp removed germinate about 25% ; stratification raises the percentage to 80% ; scalding is also effective to some slight extent ; seeds from the centre of the raceme appear to germinate better than those from the base or apex ; the size of the seed, which varies considerably on the same palm, has no influence on germination. The percentage of germination of over 4 million seeds, taken from the centre of the raceme and with the pericarp removed, sown in rows on roughly cleared moist land, was 10%. The article also deals with the various local methods of preparing the fibre, supplied by the leaf segments, and with the commercial situation.

1012. PAGUIRIGAN, D. B., DE PERALTA, F., AND 633.71  
CASUPANG, O. M.

**The effect of transplanting pricked and unpricked tobacco seedlings of different ages upon growth and yield.**

*Philipp. J. Agric.*, 1938, **9** : 177-200, bibl. 6.

The most successful size for transplanting tobacco plants in the Philippines was found to be when the length of the biggest leaf was between 10 and 18 cm. Pricked out seedlings took 58 and unpricked 51 days to reach the correct size. Seedlings put out at 44 and 79 days old made smaller plants than those put out when 51 to 65 days old. If planting out was delayed to 72 days the pricked out plants produced a better yield than the unpricked.

1013. DE PERALTA, F., AND PAGUIRIGAN, D. B. 633.71-1.8

**Studies on the salt requirement of tobacco.**

*Philipp. J. Agric.*, 1938, **9** : 253-72, bibl. 6.

Experiments to discover the most suitable nutrient medium for tobacco in sand and solution culture are described and the findings recorded. It is hoped by the information obtained to determine deficiency symptoms in the field. Among the deficiency symptoms noted is that the absence of boron from the nutrient causes the death of the terminal bud.

1014. TUBBS, F. R. 633.72-1.535 : 577.15.04

**Report of the plant physiologist for 1938.***Bull. Tea Res. Inst. Ceylon* 19, 1938, pp. 38-64, being *Annual Report for 1938*.

Investigations on the propagation of tea by cuttings are described. A grade of peat moss termed "medium" by the importers has produced a high percentage of rooting while in sharp sand the results have been poorer both in percentage rooted and in subsequent vigour of roots produced. The type of cutting is a leaf with the stem beneath it down to just above the next joint. Full mature leaves on green or slightly reddened stems are best. The age of the leaf is of moment; young leaves wither and old ones drop off and the importance of maintaining an adequate leaf surface has been demonstrated. The bud in the axil may have started to grow before the cutting is made; in this case it should be pinched back to the first fish leaf from the stem. The peat moss is broken up and moistened but not rendered sodden several days before planting. A glass-covered frame or box is necessary to hold the cuttings; they must be shaded from direct sunlight and lightly moistened at least once daily. After 5 or 6 months they will be ready for potting or planting out into nursery beds; in each case a ball of peat moss is left on the roots and the plants must be heavily shaded for two weeks. There are marked clonal differences in ease of rooting, especially in sand. The exposure of phenylacetic acid in solid form within the propagating box produced no effect. Other attempts at pre-treatment of cuttings with growth-controlling substances gave no worth while results. Grafting on the radicles of freshly germinated seeds just above the cotyledons was successful. Wire ringing and earthing young shoots gave prolific rooting.

1015. HOEDT, TH. G. E., AND SCHOOREL, A. F. 633.72-1.536

Plantverband en uitdunning in de theecultuur. (**Spacing and thinning out in tea culture.**) [English summary 1 p.]

*Arch. Theecult. Ned.-Ind.*, 1938, 12 : 310-26, bibl. 13.

Conclusions reached from an examination of data on spacing and thinning tea are:—During the first ten years yield increases with the number of shrubs per hectare. Although in the end all planting distances except the very wide ones (less than 4,000 bushes per ha. or 1,620 per acre) will probably reach the same level of yield, this level is reached very much more quickly with the closer plantings. Various factors, however, may require consideration, i.e. close planting may suffer more from drought, while a case is quoted in which wide planting led to mite attack. In close planting costs of layout are higher, in wide planting costs of upkeep are higher. Paths of less than 4 feet proved unsatisfactory in connection with the cultural operations, and a distance of more than 6 feet between centre and centre of the paths hindered rapid plucking and pruning. Thinning of existing tea gardens will not result in increased yield. The use of pruning surface, absolute production or production intensity as indicative standards for selective thinning out involve serious errors. Thinning by eye is the only practical method. The only importance of thinning out, in default of more precise experiments, appears to be when improvement of leaf quality is sought.

1016. MUTOVKINA, T. D. 633.72

**Elimination and selection of tea seedlings.** [Russian, English summary 17 lines.]

*Soviet Subtropics*, 1939, No. 5(57), pp. 45-9.

The tea plantations on the Black Sea Coast of the Caucasus represent a variable mixture of Chinese, Indian and Sino-Indian hybrid forms of tea. In this paper the different types of tea-shrubs and flushes are described and directions are given on how grading and selection work should be carried on in order to obtain forms producing large yields of high quality leaf.

1017. NAZIMOV, V. N. 633.72-1.56

**Hand-picking on Ajarian tea plantations.** [Russian.]  
*Soviet Subtropics*, 1939, No. 5(57), pp. 10-2.

A higher efficiency was achieved in hand-picking on Ajarian tea plantations by a method, which is described and illustrated on an artificial model, and which essentially consists of picking with both hands several flushes simultaneously.

1018. SIKHARULIDZE, M. G. 633.72

**Tea leaf picking.** [Russian.]  
*Soviet Subtropics*, 1939, No. 6(58), pp. 18-21.

Of the four methods tried in Western Georgia and illustrated here for picking tea, 2-3 leaf flushes in which in May 2 leaves and the so-called fish-leaf were left, in June and July 1 leaf, and in August the fish-leaf only, proved best as regards regular yields of good quality tea leaf, effect on shrub development and productiveness of labour.

1019. COOPER, H. R. 633.72-1.416.1 +1.8

**Nitrogen supply to tea.**

*Mem. Indian Tea Assoc. Tocklai Exp. Stat.* **6**, 1939, pp. 135.

It is stated in the preface that the memorandum is not a scientific treatise but is written to assist the planting community in the economical management of their estates. General principles and theories are lengthily discussed without apology, since it has been found that growers are greatly interested in these matters. Much stress has been laid on yield as a measure of effect since health and vigour have always accompanied yield. The questions of soil organic matter and of quality have not been neglected. Evidence of the relative unimportance of potash and phosphoric acid to tea has been included to justify the devotion of the memorandum to nitrogen alone. A degree of importance of the two former elements to some soils is admitted but awaits further evidence and to this end experiments are in progress in 25 commercial gardens. The results of the formal experiments are collected in an appendix.

1020. VAN DER MEULEN, A. 633.73 : 581.145.1

Over den bouw en de periodieke ontwikkeling der bloemknoppen bij coffee-soorten. (**The structure and periodical development of the flower-buds in Coffea species.**) [English summary.]

*Meded. Lab. PiPhisiol. Wageningen* **60**, 1939, pp. 127, bibl. 108, reprinted from *Verh. Akad. Wet. Amst.*, 2nd sect., deel **37**, No. 2.

A note of the chapter headings will indicate the scope of this work which is too detailed to abstract satisfactorily. 1. Survey of the literature on the periodicity of flower-initiation in perennials. 2. Classification of the varieties within the genus *Coffea* L. used in the investigation. 3. Treatment of collected material from different districts (a) with a definite dry and a definite wet season; (b) with an evenly distributed annual rainfall; (c) with an evenly distributed and very heavy rainfall. 4. Investigation of the morphology and development of the branch-system, the inflorescence and flower of *C. canephora* var. *robusta*, *C. macrochlamys* var. *excelsa*, and on the flower structure of *C. arabica*. 5. Study of previous literature on the structure and initiation of the flowers in relation to the facts revealed by the investigation. 6. Climate and situation of the districts providing the material studied. 7. Description of the periodicity of flower initiation on primary side-branches in the course of the year with some *Coffea* species. 8. Survey of the literature on factors influencing flower development of coffee, taking into account more recently acquired knowledge.

1021. DEAN, L. A., AND BEAUMONT, J. H. 633.73-1.4 +1.8

**Soils and fertilizers in relation to the yield, growth and composition of the coffee tree.**

*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, **36** : 28-35, bibl. 5.

Some results of fertilizer trials with unshaded coffee in Hawaii are discussed. Potash used in conjunction with nitrate gave increased yields, increased squared circumference of verticals

and increased growth over nitrogen alone or nitrogen and phosphate. No responses were obtained with phosphatic fertilizers. Trees on which potash had been used contained higher percentages of potash in all parts and increased starch in new growth. Localized applications around the trunks of coffee trees of nitrogen fertilizers containing half ammonium sulphate and half sodium nitrate resulted in a marked increase of soil acidity after 7 years.

1022. CHEVALIER, A., AND TROCHAIN, J. 633.73-1.543.1  
Un nouvel arbre d'ombrage pour le cafier. (A new shade tree for coffee.)  
*Rev. Bot. appl.*, 1939, 19 : 430-1.

*Albizia malocarpa* Standley, a small tree of which seeds were brought from Salvador, South America, in 1933 and distributed to the various French African colonies, is giving excellent results in providing light shade for coffee in parts of the Cameroons. It resembles *Leucaena glauca* but the rachis bears a rust-coloured pubescence.

1023. PORTÈRES, R. 633.73  
Le choix des variétés et l'amélioration des cafiers en Côte d'Ivoire. (Selection and improvement of coffee on the Ivory Coast.)  
*Rev. Bot. appl.*, 1939, 19 : 18-29.

Notes are given of the various types of coffee introduced at various times to the Ivory Coast. At the moment the most extensively planted varieties are the Gabon variety Kouilou (*Coffea canephora*) which is known also as Petit Indénié, Gros Indénié, which is a Lagos variety (*C. abeocutae* Cramer), *C. liberica* and *C. robusta*. *C. arabica* requires special conditions on the Guinea Coast including a pronounced dry season and has not made much headway. Cultivation when given at all, consists of two annual hoeings. Cover crops most in favour are *Calopogonium mucunoides* employed in most European plantations, *Pueraria javanica*, which is drought-and-fire-resistant, and *Desmodium ovalifolium*, which is initially expensive but is permanent, with a root system strong and liable to compete with the coffee, but giving such deep vertical penetration as to break up the subsoil very efficiently. A suitable manurial formula applied to soils containing some organic matter is N.P.K. 10 : 10 : 20, and on impoverished soils this is raised to 15 : 10 : 20. Pruning so far consists of merely heading back to 2 feet above ground level and the removal of all suckers from every part of the tree. *Robusta* and Kouillou varieties are usually grown haphazard on the multiple stem system, a less satisfactory method than the single stem system. There are 3 experiment stations at Man, Gagnoa and Bingerville engaged in cultural and selection work. A brief résumé is given of some of their results. These are of local interest only. Of more general interest some results of vegetative propagation are noted. Cuttings root best in the short dry season since they are at that time well supplied with nutrient reserves; all varieties do not root equally well. Grafting experiments indicated that the use of grafting wax is undesirable; cleft grafting with young scion wood is successful; painting the cuts with lemon juice and soaking the graft in water has given good results; grafts (excluding *arabica*) unite more quickly when stock and scion are of the same species; *arabica* grafted on *robusta* or Indénié resents a glass covering; the most successful grafting methods are cleft, approach and Borel\*; the best results are always in the dry season. *Arabica* on *robusta* or *excelsa* seems to take on the characteristics of the stock as regards time of flowering, ripening and floral atrophy. The degree of vigour of these combinations is at present undetermined. The remainder of the article discusses improvements in preparation necessary to produce a high class commercial product.

1024. BADAMI, V. K. 633.832-1.53  
Germination of clove seeds.  
*Publ. Dep. Agric. Mysore St.* (unnumbered), 1938, pp. 5.

It was found that a rapid 90% germination of clove seeds could be procured by removing the fruit pulp and the paper-like seed coat and sowing only the embryo with the groove upwards.

\* The scion is a green shoot with a terminal bud and 2 pairs of lateral buds, the attendant leaves being removed, or the top node may be removed thus providing a less sappy wood, cleft grafted on a young stock cut off 3 inches from the top.—[Ed.]

The fresher the seed, the better the results. A covered frame is also an advantage. The Mysore Department of Agriculture have evolved a special germination box which is illustrated. The author suggests that layerings from the best trees in India could be planted in nurseries in various parts of the country for multiplication by grafting or budding.

[While layering is possible we have always understood that the clove has never been successfully budded or grafted. We should be glad to be corrected.—ED.]

1025. SCARONE, F. 633.863.8  
Le henné dans le monde musulman. (**Henna in the Moslem world.**)  
*Agron. colon.*, 1939, **28** : 97-107, 129-140.

The producing and consuming countries of henna, *Lawsonia inermis* L., are mentioned. The plant has been cultivated from the earliest times, flower buds having been found by Schweinfurt in the sarcophagi of Egyptian tombs. Its original habitat is still unsettled. There are several horticultural varieties. Left to itself the shrub stands from 6 ft. to 20 ft. high according to environment; in cultivation it is kept at 2 ft. through continued picking. A botanical description is given. The reputation of henna for endurance of adverse conditions is a false one. In reality it is somewhat exacting, requiring good soil, a well-watered, well-drained site and protection from wind. A humid atmosphere or harsh sunlight are equally unfavourable. It responds markedly to manures. Henna properly cultivated yields from 50-100% more than uncultivated or hedge henna. Pests and diseases are not serious. A plantation can remain in cultivation for many years but with diminishing yield after the fourth year. Plants are grown from seeds or cuttings. The former, taken from purposely unpruned plants, are preferred. In Libya, where methods are most advanced, the seed before sowing is soaked in water, changed daily, for a week, then placed in little heaps which are kept moist with warm water for 3 days but carefully drained. The seed swells and softens and is then sown on wet ground (July-August). Irrigation is gradually reduced as the plants grow and ceases with the rains. In May-June the next year the seedlings are planted out in quincunx, about 20 per sq. metre, on soil heavily fortified with organic farmyard manure. An annual application of chemical manures is advised, further organic manuring being unnecessary. A spring and winter soil cultivation are given and weedings as required. The crop is taken in July and again in the autumn, the bush being cut down to ground level (less severely the first year) when the flower buds are beginning to form. These prunings are dried on the banks surrounding the irrigation flats and the leaves are removed from the branches when they begin to dehisce. Adequate drying depends on sufficient labour and space, which are not always available, and losses often occur. Artificial driers have been recommended but not tried. The more primitive cultivation methods of other countries are described. An interesting account occupying several pages is given of the uses to which henna is put.

1026. ADRIAENS, L. 633.88.32.491  
La culture du ricin au Congo Belge. (**Castor oil plant cultivation in the Belgian Congo.**)  
*Bull. Inst. colon. Marseille. Mat. grasses*, 1938, **22** : 161-6, bibl. in text, being taken from *Le ricin au Congo belge, étude chimique des graines, des huiles et des sous-produits, Mem. Sect. Sci. nat. med. Inst. roy. col. belge*, 1938, Vol. **6**, fasc. 5, pp. 206.

The advisability is stressed of selecting seed of the castor oil plant in the first place from local strains rather than using imported seed which may not be suitable for local conditions. *Ricinus* is an exhausting crop and requires considerable quantities of nitrogenous and phosphatic manures, a need of which the natives are perfectly aware and for which they are able to provide in their small plots. Difficulties arise in cultivation on a large scale. The situation may be in some measure dealt with by a rotation; that suggested for Ceylon is 1st year, tobacco, maize, cotton; 2nd year, cassava, sweet potato, yam; 3rd year, castor oil; 4th year, legumes, ground nuts. Methods of extracting the oil economically while leaving the cake as a usable by-product are discussed and solvent extraction by trichlorethylene seems the most feasible. In order

to get the natives to grow the crop properly a system of collaboration between native and European is suggested. Free selected seed will be issued to the native grower, his plantings will be under supervision of the European and after harvest he will receive a price fixed at planting time on condition that the seed delivered is sound and clean. There are a number of obvious difficulties in this arrangement and these are discussed. A local factory would be necessary.

1027. YERSIN, A. 633.88.51  
 Essais d'acclimatation des arbres à quinquina en Indochine. (**Acclimatization of *Cinchona* in Indo-China.**)  
*Rev. Bot. appl.*, 1939, 19 : 237-42.

The trials are taking place at Diom, altitude 3,000 ft., where conditions of soil and climate inhibit the normal development of the trees. Trees flower in the second year, which is too early; in the third year collar rot and die back of the branches begin. Commercial production can only be profitable on a 5-year-cycle and in the unlikely contingency that these stunted trees produce a high yield. Present practice is to grow the plants only 3 ft. apart which is too close; there should be a progressive and selective thinning. A complete inorganic manure combined with thinning produced considerable improvement but induced a huge growth of weeds which had to be cleaned off. Large seedling nurseries were created which were devastated by rhinocerus beetle originating in eggs deposited in cattle manure. This onslaught was checked by using only chemical manures. An exceptional rainfall favoured the growth of fungi which destroyed 50% of the seedlings. It is hoped with experience successfully to combat these difficulties. The author remarks that so far the only profitable result accruing from his twenty years of continuous and disinterested study of the subject is the certainty that hasty conclusions lead only to premature discouragements or vexatious misconceptions. His conclusions are, therefore, stated in terms of hope and fear rather than of conviction.

1028. STOFFELS, E. H. J. 633.88.51  
 Le quinquina. (***Cinchona*.**)  
*Publ. Inst. nat. Étude agron. Congo belge, Sér. tech.* 24, 1939, pp. 51, bibl. 48, 18 fr.

The bulletin describes the cultivation of quinine, mainly as carried out in the Dutch East Indies and in the Belgian Congo. When seed is used it is sown as soon as ripe in specially prepared beds of light soil under shelters consisting of enclosures formed with movable bamboo shutters surmounted by a palm thatch roof. The seed beds are kept dark till germination begins a month or so after sowing. Light and air are then gradually admitted. Trouble is often experienced from fungus attack. This can be greatly reduced if the ventilation and watering after germination receive proper attention. Vegetative propagation (grafting) is necessary to preserve the high quinine content of the selected clones, although soil and climate may even then exert a modifying influence. *Cinchona succirubra* and *C. robusta* are the usual rootstocks. Their roots contain 3 times less quinine than those of *C. Ledgeriana* which is usually the scion variety. The type of graft used is the side graft made as low down as possible on stocks of pencil thickness. The cut penetrates into the wood to about one-quarter the stock diameter. In Java the scion has two joints and the leaves are left on, though cut to one-third. In the Congo the leaves are removed altogether. A transverse incision in the stock 10 cm. above the union is said to improve the percentage of success. The first plantings are close, about 10,000 to the hectare. The first returns are secured when the trees are about 3 years old and are obtained from prunings of the lower branches or the removal of multiple trunks. This continues in successive years until the branches have been removed to a height of 1.80 metres. A regular thinning of the plantation provides a further yield. A thinning takes place whenever the branches of adjacent trees begin to touch. When growth slows up, that is in 9 to 15 years according to locality, the remaining trees are removed. Methods of bark removal and subsequent treatment are described. The paper contains a great deal of practical information which cannot be condensed.

1029.	PIERIS, W. I. <b>Replanting of rubber.</b> <i>Leafl. Rubb. Res. Sch. (Ceylon) S.H.1</i> , 1938, pp. 14, and PIERIS, W. I. <b>Preparation of smoked rubber sheet.</b> <i>Leafl. Rubb. Res. Sch. (Ceylon) S.H.3</i> , 1938, pp. 12.	633.912-1.543 633.912-1.56
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These publications are written for the information of the smallholder and from his point of view. They deal simply and clearly with their subjects and are entirely practical. Tables of estimated costs in Ceylon of the various operations are included.

1030.	MAURI, N. AND G. <i>Feijoa Sellowiana</i> . Sa multiplication. ( <b>Propagation of Feijoa.</b> ) <i>Rev. Hort. Agric. Afr. N.</i> , 1939, <b>43</b> : 100-3.	588.83
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*Seed.* The minute seed of *Feijoa Sellowiana* is difficult to extract satisfactorily from the pulp of the fruit in which it is embedded. The best method is to crush the ripe fruit under water and let it stand until the seed sinks. The still floating pulp can then be decanted off. A course of several washings will produce quite clear seed. If this method is regarded as too troublesome pieces of unwashed pulp containing seeds may be set in the seed bed. The seedlings however appear in clumps which have to be drastically thinned, the loss being much greater than those from the washing process. Pricking out is done when the seedlings are 4 cm. high. If watering is withheld sufficiently to allow the seedlings to flag slightly before pricking them out into cool, moist soil, there should be few losses. *Cuttings.* Various types of cutting were tried in various rooting media without success, though there was usually considerable callusing.\* *Grafting.* One-year-old pot-grown seedling rootstocks were whip-grafted (unwaxed) at the collar and plunged above the graft junction in moist peat moss in a forcing house (77-82° F.). In 3 weeks perfect union had been obtained in most cases. The plants were removed and the unions covered with grafting wax to prevent desiccation. As a result 60% died. When waxed paper collars were substituted for grafting wax the results were more successful, a take of 70% being obtained.

1031.	JARRY-DESLOGES, R. Le greffage du <i>Casimiroa edulis</i> La Llave. ( <b>Budding <i>C. edulis</i>.</b> ) <i>Rev. hort., Paris</i> , 1939, <b>26</b> : 357.	634.343-1.541.5
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*Casimiroa edulis* La Llave has been budded without difficulty in the south of France, 80% success being obtained at the first attempt. The stocks were seedlings and the scion was a selected seedling which had proved to be very early fruiting. Usually plants fruit too late to be of value.

1032.	REICHERT, I., AND HELLINGER, E. <b>Dothiorella rot of bananas and oranges in Palestine.</b> <i>Palestine J. Bot. R. Ser.</i> , 1938, <b>2</b> : 79-88, bibl. 29.	634.4 : 634.771 + 634.31
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A rot of banana fruits caused by *Dothiorella* was first recorded for Palestine in 1929. The disease is a typical tip end rot which progresses towards the stem end. A characteristic of the disease is the fine white powder on the rotten parts, the result of ejected pycnospores. The fungus develops best under the humid conditions of winter and is little affected by temperature. The form of rot produced on bananas is identical with that produced by the *Dothiorella* found on orange fruits. Their morphological features are also identical. There appears, however, to be a difference in vigour between the two strains. A review of the *Dothiorella* occurring on other fruits in Palestine shows that they resemble morphologically *Dothiorella* of banana and citrus in spite of bearing different names. They all resemble *D. gregaria* Sacc. which Fawcett and Horne give as the imperfect stage of *Botryosphaeria Ribis* G. & D. The perfect stage

\* Bailey's Standard Cyclopaedia of Horticulture (1927) says cuttings of young wood 4 inches in length will root in sand over bottom heat in a month or two.—[ED.]

obtained from Palestine citrus fruit differs physiologically from *B. Ribis* in being non-chromogenic on starchy media. [From authors' summary.]

1033. RODRIGO, P. A. 634.431-1.541

**Notes on the propagation of the Ponderosa chico.**

*Philipp. J. Agric.*, 1938, 9 : 357-64.

The variety concerned is a horticultural variety of *Achras Zapota* Linn. named Ponderosa, raised in the Philippines from seed of the species imported from Java. The fruit is very large and of exceptional quality but the tree is a shy bearer. The parent tree has been heavily marcotted and fresh methods of propagation are sought. Suitable stocks were found for grafting in its own seedlings and in those of the variety St. Croix. These grow more quickly than the native chico. Grafted and inarched plants on these stocks have flowered but not fruited in the 3 years after planting. Plants marcotted at the same time fruited in the 3rd year. Seedling trees of Ponderosa fruited in 8 years. The fruit quality was equal to that of the seed parent but the size was much less.

1034. DE LA BÂTHIE, H. P. 634.46

Un arbuste fruitier intéressant pour les pays tropicaux arides. (A fruit tree of interest for dry tropical countries.)

*Bull. Soc. bot. Fr.*, 1938, 85 : 494-6, noted also in *Rev. Bot. appl.*, 1939, 19 : 353.

*Lemuropisum edule* Perr., recently described by the author, belongs to a new monospecific genus of the Leguminosae. It inhabits the dry and rocky sub-deserts of Madagascar. The fruits consist of 6-12 white beans, without albumen and with a large embryo containing much starch and sugar. The possible utility of this plant in dry countries where the cultivation of ordinary food plants is difficult is pointed out.

1035. PRESCOTT, J. A. 634.58-1.4

**Some characteristics of soils used for the cultivation of peanuts (*Arachis*) in the Northern Territory of Australia.**

*J. Coun. sci. industr. Res. Aust.*, 1938, 11 : 261-5.

The soils favoured for peanut growing are a sandy alluvium. Chemical analysis did not reveal any clear cut distinction in suitability, but mechanical analysis showed that the proportion of clay in the top soils of the best peanut soils was low and the relative amounts of coarse and fine sands high.

1036. SCARONE, F. 634.6

La noix de babassù (*Attalea funifera*). (The pissaba palm.)

*Agron. colon.*, 1938, 27 : 78-82.

The palm, *Attalea funifera* Mart., is a native of Brazil and during the 1914-18 war became of considerable importance for the oil of its nuts. So much so that Brazil has forbidden the export of the unshelled nut fearing the painful experience of *Hevea* rubber be repeated and culture established in foreign countries. Though found on many different soils the preferred habitat is in the neighbourhood of rivers, but it is found also well inland in the bushy situations where the climate is moist and equable. Each palm produces 2-6 spathes bearing each 200-300 nuts, varying in size from a lemon to a small coconut. The palm grows fast and if cut down soon re-establishes itself by suckers from the roots. The tree is not cultivated and at present this is scarcely necessary since the collected crop is never fully disposed of or gathered. Among the reasons for the failure to exploit this crop to the full are shortage of labour and, until recently, shortage of machinery capable of dealing with the very hard nuts. The kernels yield an oil closely resembling coconut oil, but 100 kilogrammes of nuts produce only 9 kg. of kernel or 5-6 kg. of oil. The husks are used as fuel to drive the extracting machinery and carbon made from them can be used in gas masks.

1037. AUBRÉVILLE, A. 634.6  
 Les deux stations expérimentales du palmier à huile. (**The oil palm experiment stations at Mé, Ivory Coast and at Pobé, Dahomey.**)  
*Rev. Bot. appl.*, 1939, **19** : 1-14.  
 The two oil palm experiment stations dealt with here were started in 1924 and the article begins by explaining that criticisms of lack of progress are unfounded. The present position is that palms raised from selected wild palms which were naturally cross pollinated are now in their 8th or 9th years and bearing fruit. As a whole they have proved themselves very superior to the general run of wild trees and now that hand pollination with selected pollen parents becomes possible on these young palms the business of selection can proceed with more certainty; even so the results will not be apparent until 1950. One of the practical results of the first seed selection from wild palms is the greatly increased percentage of the desired thin-shelled forms, 46% and 48% at Pobé and Mé respectively, which has appeared among their progeny. The percentage of thin shells among wild trees is only 2%. The need for the co-ordination of experiments with workers in other countries is stressed, particularly as regards behaviour of local selections when removed to a fresh environment. The need for the establishment by the natives of plantations from selected seed, which even now could be provided by the experiment stations, is also stressed. Spaced at 9-10 metres the trees would not interfere with under cropping with food plants. The plantations already existing in the French West African Colonies are also discussed.

1038. STEYAERT, R. L. 634.6-2.4  
 Notes sur deux conditions pathologiques de l'*Elaeis guineensis*. (**Two pathological conditions observed in the oil palm.**)  
*Publ. Inst. nat. Étude agron. Congo belge*, Sér. sci. **18**, 1939, pp. 13, bibl. 4, 4 francs.  
 1. A fungus disease of *Elaeis guineensis* in the Belgian Congo is described. The disease starts in the axils of old leaves and penetrates into and completely rots large portions of the trunk without leaving more than a slight exterior indication. The actual fungus causing the disease is uncertain. The author is inclined to attribute it to *Delortia palmicola* von Höhnel, which is always present, though hitherto it has not been considered other than saprophytic. Control measures suggested are the removal and burning of badly attacked trees, the cutting out of affected parts in trees less seriously attacked, for which operation an adze is useful, and painting the wound with a disinfectant. In badly infected districts it might be advisable to apply a wash to the trees immediately after removal of the dead leaves.  
 2. A rotting of the hearts of young *Elaeis guineensis* seedlings in the nursery is described. The cause is at present completely unknown.

1039. MOORE, D. C., AND ALDRICH, W. W. 634.62-1.415.3  
 Leaf and fruit growth of the date in relation to moisture in a saline soil.  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, **36** : 216-22, bibl. 7.  
 The leaf elongation of the date palm was accelerated or depressed with the depletion and replenishment respectively of the soil moisture. Water deficits as indicated by reduced rate of leaf elongation resulted in a reduced rate of increase in the fresh weight of fruit. Further study is necessary to decide when water deficits may reduce the rate of dry matter deposition in the fruit. The rate of leaf growth might be used as an index of water deficits in the palm.

1040. BAKER, R. E. D. 634.651-2.8  
 Papaw mosaic disease.  
*Trop. Agriculture, Trin.*, 1939, **16** : 159-63, bibl. 12.  
 The symptoms and possible causal agents of the mosaic disease of papaws (*Carica Papaya*) in Trinidad are discussed. The disease is common and has been the subject of investigation at the Imperial College of Tropical Agriculture from time to time during the past 10 years.

No satisfactory solution of the cause of the disease has been discovered, but a limited control seems possible. The infected tree should be cut back 3 to 4 feet or more below the growing point and 2 or 3 healthy shoots should be allowed to develop. The cut surface should be covered with an inverted jam tin or other device or the hollow filled with concrete to prevent rotting or the breeding of mosquitoes. This suggests the possibility that the cutting back of old trees might rejuvenate them, though this method has not been tried on a plantation scale. In his own garden the author has 3 trees which have been attacked and so treated 5 times in the last 3 years and are still alive and fruiting. Resistant papaya trees are thought to occur in Jamaica but have not been so far discovered in Trinidad.

1041. PARRIS, G. K. 634.651-2.8

**A new disease of papaya in Hawaii.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 263-5.*

What is described as probably a virus disease of papaya new to Hawaii is described. No organisms have been found to account for it. The symptoms resemble those of the papaya mosaic of Trinidad (see abstr. 1040), but while in Trinidad sap inoculations have failed to transmit the disease, in Hawaii a 75% success was achieved, using carborundum as abrasive.

1042. PODLUZHNY, L. F. 634.662-1.541.11

**Grafting the jujube.** [Russian.]

*Soviet Subtropics, 1939, No. 7(59), pp. 49-1.*

Recent experiments carried out at the Azerbaijan Research Station showed that *Zizyphus sativa* Gaertn. may be used under Apsheron conditions as a stock for vegetative propagation of the jujube (*Zizyphus Jujuba*). Budding in August with dormant or non-dormant wood gives the best results with scions taken from the vegetative shoots of the current year. The wood should be removed from the shields when scions that are strongly bent are used for budding.

1043. APPERT, M. 634.771

Quelques remarques sur la culture du bananier. (**Notes on banana cultivation.**)

*Agron. colon., 1938, 27 : 135-9.*

The article is specially concerned with conditions in French Guiana. The plantation should be situated on fairly flat, sunny and sheltered ground. Many reasons for not using steeply sloping ground are given. In clearing new ground the tree stumps, large and small, must be removed either by the use of explosives or the monkey jack. Stumps not so treated invariably send up suckers, continue to exhaust the soil and hinder irrigation. To avoid stump extraction some planters suggest overhead irrigation, as used in market gardens. The method is so far untried. The regular removal of surplus suckers is shown greatly to increase yield. Gouging out the suckers with a carpenter's gouge is a common but bad practice leading to fungal and other troubles. The sucker should be removed with a clean cut with knife or spade. The dead leaves should not be left hanging round the trunk which is in no need of such protection. The warmth and humidity created between trunk and the decaying leaves is very favourable to growth of fungi and bacteria. Banana growing is not so easy as is often stated. It is in fact a horticultural crop needing continual attention.

1044. ROGER, L. 634.771-2.4

Sur deux maladies des bananiers à la Guadeloupe. (**Two banana diseases at Guadeloupe.**)

*Agron. colon., 1938, 27 : 246 : 161-76, bibl. 26.*

The diseases discussed are *Cercospora* leaf spot (*C. Musae* Zimm.) and bacterial wilt, also called moko disease, of which the causal organism is *Phytoponas solanacearum* (E. F. Smith) Bergey. Both are well known and documented.

1045. MALLAMAIRES, A. 634.771-2.651.3  
 La pourriture vermiculaire du bananier de Chine . . . (Eelworm rot of  
 the Chinese banana.)

*Agron. colon.*, 1939, 28 : 33-42, 255 : 65-75, bibl. 16.

The Chinese banana (*Musa nana* Lour.) of the French West African colonies is attacked by an eelworm identified as *Anguillulina similis* (Cobb) Goodey. Considerable damage has been caused. The initial symptoms are a yellowing of the leaves, signifying that a part of the roots has already rotted. Roots not yet rotted bear many red to purple or brown spots. On cutting the rhizomes or bulbs a close inspection shows brownish spots on the periphery 10-20 mm. deep; the tissues are rotten and the cavity contains a "veritable purée" of eelworms. Bananas so attacked develop slowly and flower seldom and finally die or at any rate remain totally useless. Soils least liable to this eelworm are alluvials over a laterite subsoil while lands recently reclaimed from the sea are entirely immune. Bananas which are well tilled, manured and irrigated are able to resist the parasite to a large extent. The eelworm has also been found on coffee but without doing much harm. Control is obtained by plunging the planting bits, previously washed clean of earth, for 5 minutes in water heated to 65° C. The temperature must not fall below 55° C. or the requisite heat of 52° C. at 1 centimetre depth within the bulb will not be reached. Using a 200-litre tank 1,000-1,200 bits could be treated in an 8-hour day, or enough to plant a hectare. The attack through cultivation methods consists in lowering the water table where necessary to encourage deep and abundant rooting and a system of fractional manuring with the same object. This is the giving of small doses of N and/or K at varying strengths at monthly intervals throughout the whole growing season. P is given in one dose at the start. The quantities for each month are stated. This, combined with irrigation, has rendered many plantations resistant. Overhead irrigation is stated to have been very effective.

1046. SIDERIS, C. P., YOUNG, H. Y., AND KRAUSS, B. H. 634.774-1.84 : 581.192  
**The distribution of uncombined hexosamine in pineapple plants supplied either with ammonium sulphate or calcium nitrate salts.**  
 Reprinted from *J. biol. Chem.*, 1938, 126 : 233-9, bibl. 12, being *Tech. Pap. Pineapple Exp. Stat., Hawaii*, 117.

The distribution is reported of free hexosamine in different sections of pineapple leaves, roots and stems of two sets of 1-year-old pineapple plants, one grown in ammonium sulphate and the other in calcium nitrate solution cultures. Hexosamine was present in considerably greater amount in the advanced and mature leaves of plants supplied with ammonium sulphate than in those of plants supplied with calcium nitrate. In the active and young leaves of both plants the amounts of hexosamine were approximately the same. The methods of determination are outlined.

1047. SIDERIS, C. P., AND KRAUSS, B. H. 634.774 : 581.145.2  
**Growth phenomena of pineapple fruits.**  
 Reprinted from *Growth*, 1938, 2 : 181-96, bibl. 8, being *Tech. Pap. Pineapple Exp. Stat., Hawaii*, 111.

A mathematical analysis is presented of data on the growth of pineapple fruits.

1048. VUILLET, J. 634/5 : 635.952.2  
 Une plantation de karité, serait-elle rémunératrice? (Will a plantation of  
**Butyrospermum Parkii\*** pay?)  
*Rev. Bot. appl.*, 1939, 19 : 431-3.

*Butyrospermum Parkii* Kotschy is a native of the upper valleys of Senegal and Gambia to the Nile. When full grown the trunk has a diameter of 50 cm. at 4 ft. from the ground. At this age the tree should yield annually about 30 kilos of purple berries, the size and shape of a large plum. The pulp is edible and the kernel provides a kind of vegetable butter. Although it can hardly be said to be commercially grown the tree is given some cultural attention by the natives in order to maintain yields. It is resistant to bush fires and insect attack, and has

\* Shea butter, belongs to *Sapotaceæ*.

great regenerative powers. It is suggested that care of the numerous wild trees will be more profitable than growing it in plantations, since the tree is 12-15 years from seed before it bears. It is said that by merely clearing away the bush which has grown over the sites of former stands of *Butyrospermum* a large population of suckers will spring up capable of yielding in a few years 150-300 kg. of dry nuts or 50-150 kg. of vegetable fat per ha. An example is given where this occurred in Upper Senegal when a decree was made forbidding the cutting of this tree. The wood, being resistant to insect attack, is much sought after for the posts of dwelling houses.

1049. BOLHUIS, G. G. 635.23 : 631.535  
 Omgekeerd geplante stekken van cassave. (Cassava cuttings planted inversely.)  
 [English summary.]

*Landbouw*, 1939, 15 : 141-51, bibl. 4.

Cuttings of cassava planted upside down and harvested at the age of 9 months and 6 months produced many more stems than cuttings planted normally, but the number of useful cuttings produced by these stems was reduced. The yield of roots was greatly reduced and this leads to the suggestion that there may be an optimum method of planting the cuttings to obtain the greatest yield and this should be discoverable by experiment. The native opinion that the roots of cuttings planted reversed are more poisonous than the roots of cuttings planted normally was confirmed.

1050. CHEVALIER, A. 635.65  
 Une plante coloniale précieuse pour l'alimentation, le haricot doré ou boubour.  
 (*Phaseolus aureus* or green gram, a valuable food plant for the (French African) colonies.)

*Rev. Bot. appl.*, 1939, 19 : 314-22.

Attention is called to the value of *Phaseolus aureus* Roxb. as a food plant for the French African colonies. This haricot has been extensively cultivated in India and Malaya and Indo-China from early times. It is, however, often confused with *P. Mungo* L., black gram, and with *P. radiatus* L. (*P. sublobatus* Roxb.). As a food plant it possesses all the nutritional qualities of the soybean but it requires a tropical or subtropical climate. A note is given of its various uses in the countries where it is extensively grown. It can be interplanted with maize and soybean and rice lands suit it perfectly. The article concludes with mention of a number of other haricots possibly suitable for Africa, which so far have not been grown there.

1051. RODRIGO, P. A. 635.655  
 Acclimatization of the soybean in the Philippines. I.  
*Philipp. J. Agric.*, 1938, 9 : 223-50, bibl. 13.

The results are presented of a 4½-year acclimatization test on soybean in the Philippines. Fifty-six different varieties from various parts of the world were used. Seven varieties were found promising for rainy season cultivation, but if maturity coincided with heavy rain the crop was sometimes destroyed in whole or in part. Dry-season cultivation was not very satisfactory: the best of the rainy season varieties also proved best in the dry season. Names and performances will be found in the original article.

1052. PARSONS, T. H. 635.937.96  
 The horticultural *Hibiscus* in Ceylon.  
*Bull. Ceylon Dep. Agric.* 93, 1938, pp. 6, 75 cents.

The author describes some 26 varieties of *Hibiscus* originating in Ceylon or Hawaii and now grown under observation at Peradeniya. He noted that the Ceylon varieties are normally propagated satisfactorily from cuttings but that those from Hawaii have to be budded using the T or inverted T method. Recent experiments in crossing the better varieties of shoeflower (*Hibiscus rosa-sinensis*) have been very successful. These ornamental *Hibiscus* are very little troubled by insect or fungus pests. Five coloured plates give a good idea of the flowers of some of the better varieties.

1053. DRIEBERG, C.,\* AND ZYLVIA, ST. L. H. DE.  
**Beekeeping for beginners.**  
*Bull. Dep. Agric. Ceylon* 92, 1938, pp. 18, 25 cents.  
A useful bulletin for would-be bee-keepers in the tropics. 638.14

**STORAGE AND MARKETING.**

1054. TOMKINS, R. G.  
**Recent work in food preservation.**  
*Publ. Low Temp. Res. Stat. Cambridge*, pp. 7, bibl. 10. 664.8

This is a brief survey of some of the recent trends in food preservation, being an address delivered at a Sessional Meeting held at Cambridge on 4 November, 1938. (Copyright of the R. Sanitary Institute.) The most important advance in fruit storage technique is the discovery of gas storage, i.e. storage in a refrigerated gas-tight store in which the composition of the air is regulated. A comparison of cubic feet available for fruit storage in England shows that in 1928 410,360 cu. ft. of cold store were available and none of gas store, whereas in 1937 644,010 cu. ft. of cold store and 2,964,659 cu. ft. of gas storage room were available. Ethylene at low concentrations is being increasingly used for conditioning fruit after storage. Progress is being achieved in juice production from cull fruits and the different processes involved. Canning progress has been due to more exact knowledge of best methods of sterilization, the manufacture and closing of cans, etc. Fundamental work is in progress on the ripening processes of fruit and vegetables and the control of fungal rots. Methods under investigation include ray and chemical treatment to inactivate fungus spores and the use of wraps containing fungicides.

1055. ANON.  
Aeblesopbevaring. (**Apple storage : wraps to prevent scald.**)  
*Tidsskr. Planteavl.*, 1937, 42 : 545-8. 664.85.11 : 632.19

Unsuccessful attempts to prevent scald by means of paper wraps, oiled and unoiled, are recorded.

1056. EAVES, C. A.  
**Physiological disorders of stored apples in Canada.**  
*Contr. Div. Hort. Dep. Agric. Ottawa* 497, 1938(?), pp. 17 (mimeographed), bibl. 25. 664.85.11 : 632.19

The author considers that the term "internal breakdown" is too broad in concept in the light of varietal reaction to storage conditions. The present paper in which notes are given of the symptoms, causes and possible remedies for a number of phenomena loosely termed "internal breakdown" is based mainly on Plagge and Maney's classification in Functional diseases of the apple in storage (*Bull. Ia agric. Exp. Stat.* 329, 1935, H.A., 5 : 302). He considers them as follows :—*Low temperature breakdown* including soft scald, soggy breakdown and internal browning; *breakdown associated with senility* including Jonathan breakdown, mealy breakdown, core flush, cortical flush and vascular breakdown; *breakdown associated with storage atmosphere* including gas storage injuries, superficial scald, scald breakdown; *breakdown associated with orchard conditions* including bitter pit, water core and cork; and *unclassified phenomena* such as Jonathan spot and freezing injury.

1057. GUNNESS, C. I., COLE, W. R., AND ROBERTS, O. C.  
**Farm storages for New England apples.**  
*Bull. Mass. agric. Exp. Stat.* 360, 1939, pp. 32. 664.85.11

Apples which are intended for long storage should be stored at 32° F. McIntosh apples, which are to be marketed by 1 January, may be held at 45° at first and reduced to 32° by the third week after picking. Apples treated in this manner will develop a better flavour than apples stored continuously at 32°. During the storage period relative humidity should be maintained

\* the late.

at not less than 85%. Certain autumn apple varieties may be kept for short periods in ordinary stores. Late varieties may be held for longer periods if they are to be distributed to retail dealers. Apples held in cold store usually fetch a better price than similar fruit stored in ordinary stores.

1058. WILKINSON, E. H. 664.85.11 : 632.4  
**A note on the prevalence of fungal spots and rots of apples in cold store at Long Ashton.**

*A.R. Long Ashton Res. Stat. for 1938*, 1939, pp. 84-90, bibl. 2.

The notes given here refer to fungi found on the 1937 apple crop from different growing districts stored at Long Ashton. The most prevalent rot of the lenticular type was caused by *Gloeosporium album* Osterw. *Botrytis cinerea* Pers. also caused much rotting in fruits suffering from stalk-end russetting, especially in Cox's Orange Pippin and Laxton's Superb.

1059. FISHER, D. F., AND LUTZ, J. M. 634.75 : 656 + 631.564  
**Handling and shipping strawberries without refrigeration.**

*Circ. U.S. Dep. Agric.* 515, 1939, pp. 16, bibl. 6.

The tests recorded here were made on strawberries grown at Beltsville and Salisbury, Maryland, and at Willard, North Carolina, and shipped direct to Washington, New York, and other centres. Illustrations are given of different packs used. It was found that early morning picking was best. Care in picking greatly influenced carrying quality. Berries picked not quite ripe carried better than those picked fully ripe. It was found advisable to pick clean at least every other day during warm weather. Excessive crushing and damage to fruit occurred in the 32 quart crate commonly used and carriage was better in all other crates used. Training pickers to pick carefully and so eliminate the necessity for repacking is advisable. There was no consistent advantage gained by covering the berries in the separate cups (chips—ED.) with cellophane. Decay was closely related with temperature especially above 40° F.

1060. HAMERSMA, P. J. 634.31 : 577.16  
**The vitamin C content of South African oranges.**

*Sci. Bull. Dep. Agric. S. Afr.* 163 (Chemical Series 148), 1938, pp. 53, bibl. 36.

I. The vitamin C content of Navel Valencia oranges and seedlings grown in South Africa and its stability over storage periods, some exceeding three months at approximately 38° F., have been examined by the Division of Chemical Services, Department of Agriculture, Pretoria. On storage at 38° F. for 3 months no loss in vitamin C occurred but the seedlings actually showed an increase. Valencias from Nelspruit, Eastern Transvaal, and Rustenberg, Western Transvaal, alone showed variation of importance between early and late picking. With these vitamin C per c.c. exhibited a lower value for late picking, the acid was also lower in the late than in the early pickings. Seedlings seemed to have a higher vitamin C standard per c.c. and a higher acid content than Valencias or Navel. The differences between Valencias and Navel in vitamin C value and in the effect of storage on this value is insignificant except that Nelspruit Valencias have slightly higher values. Comparative tables are given showing that notwithstanding their sweetness the vitamin C per c.c. of South African oranges, when sold on the overseas market, is not of a lower standard than that of oranges from other countries, nor will South African oranges have less vitamin C when they arrive overseas than they contained originally. II. Loss of weight of Navel stored from 0-12 weeks at 38° F. is of no practical value. It is caused by both peel and juice the latter being somewhat more responsible. Acidity and vitamin C per c.c. are equal in the Navel and stem halves of oranges. There is a significant difference in vitamin C per c.c. between separate trees in the same orchard and to a greater extent between localities. The differences are ascribed to differences in acidity.

1061. CLARK, H. E. 634.774 : 581.192

**Oxalates in pineapples.**

Reprinted from *Food Res.* 1939, **4** : 75-9, bibl. 7, being *Tech. Pap. Pineapple Exp. Stat., Hawaii*, **110**.

The concentration of oxalic acid in pineapples was found to be so low as to have no physiological importance in human nutrition. The investigations reported were undertaken at the Pineapple Experiment Station, Hawaii. The variety tested was the widely grown Cayenne. A description and critical evaluation of the technique employed is given.

1062. WARDLAW, C. W., LEONARD, E. R., AND BARNELL, H. R. 664.85.771

**Banana storage investigation 1937-39.**

*Trop. Agriculture Trin.*, 1939, **16** : 130-42, bibl. 9.

This paper gives (a) an account of the ripening of Trinidad-grown Gros Michel bunches from different districts at tropical temperatures; (b) a critical consideration of chilling in the Gros Michel variety; (c) an account of the effect of *Cercospora* leaf disease on the keeping quality of fruit in storage and of (d) bulk storage trials with I.C.2 bananas. Chilling injury is shown to be associated with the onset of ripening during cold storage. Fruit heavier than three-quarters full will always show some chilling if kept at 53° F. for more than 11-12 days. Biochemical investigations show that in fruit chilled beyond the normal commercial period for that grade various ripening changes in the carbohydrate constituents are present, whereas in fruit not so chilled minor changes are observed. Chilling may render the fruit astringent with high starch and low sugar content and in extreme cases deprive the fruit, through inhibition of the starch-hydrolysing mechanism among others, of ability to ripen. Fruit from plants affected by *Cercospora* leaf disease may be characterized by a buff-coloured pulp, premature ripening, enhanced susceptibility to chilling injury and too rapid ripening on removal to a higher temperature. Banana I.C.2 is a possible substitute for Gros Michel, should any disaster happen to the latter. Its optimum harvesting maturity for transport at 53° F. lies between the three-quarters full and heavy three-quarters full grades of Gros Michel. After 15 days at 53° F. standard bunches can be ripened at 68° F. to a product of good colour, flavour and texture. No severe finger dropping has been observed.

1063. MASURE, M. P. 581.12 : 664.85

**Some comparisons of methods of measuring fruit respiration.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939*, **36** : 223-9, bibl. 9.

In a study of fruit respiration a comparison of rates was made as measured by two titrimetric systems, one employing Reiset towers and the other a modified Magness and Diehl apparatus. The latter system gave values approximately 6% lower than the former. Values obtained from a gravimetric system run simultaneously with the other two and employing Ascarite as the CO<sub>2</sub> absorbent emphasized the necessity for use of a desiccant to absorb the water given off by Ascarite in its absorption reaction. Even after allowing for a desiccant error the Ascarite values were 8% lower than those obtained with the tower system and this suggests that additional precautions may also be necessary in precision studies. It has been assumed solely on the basis of magnitude that the tower system gave the most nearly correct rates. [From author's summary.]

1064. SINGH, B. N., AND MATHUR, P. B. 664.84.64

**Studies in fruit storage. I. Influence of the stage of maturity and storage temperature on respiratory drifts during the ripening of tomato fruits.**

*Ann. appl. Biol.*, 1939, **26** : 203-12, bibl. 9.

The storage life of tomatoes was found to be longest at a temperature of 5.7° C., less at 9.8° C. and least at 14.7°, these being the three temperatures tried. At a given temperature life was longer in fruits picked green than in those picked yellow or orange. Notes are given of the respiration curves after transference from low to high temperatures.

1065. GERHARDT, F., AND EZELL, B. D. 664.85.035.1

**A method of estimating the volatile products liberated from stored fruit.**

*J. agric. Res.*, 1939, **58** : 493-503, bibl. 21.

Details of procedure are given for a method of measuring the emanation of volatiles from stored fruit. The method is dependent upon the absorption of these materials in concentrated sulphuric acid, oxidation with an excess of standard ceric sulphate, iodometric titration of this excess with sodium thiosulphate, and expression of the results in terms of ceric sulphate reduced. Certain applications of the method have been presented. They include measurements of the volatile substances in air from various sources, interrelation of respiration and liberation of volatile substances from Golden Delicious apples, and the emanation of volatile materials as influenced by the presence of certain fruit-rot fungi. [From authors' summary.]

1066. DIAKONOFF, A. 664.85.037 : 632.7

Bestrijding van schadelijke insecten in tropische vruchten door middel van koeling. (Control of insect pests in tropical fruit by refrigeration.) [English summary.]

*Landbouw*, 1938, **14** : 690-6.

The fruit fly (*Ceratitis capitata* Wied.) can be exterminated by holding the fruit 8-11 days at  $-1.7$  to  $-0.6^{\circ}$  C. or for 18 hours at  $-12.2^{\circ}$  C. The fly *Chaetodacus cucurbitae* Coq. is controlled by thorough refrigeration which can proceed slowly, and so, too, are the borers *Anastrepha fraterculus* Wied. and *A. ludens* Loew. The mango beetle *Cryptorrhynchus mangiferae* F. is more resistant. It requires at least 5 days at  $-12^{\circ}$  C. to control with certainty. A temperature of  $-2^{\circ}$  C. for 50 consecutive days was survived by 15% of adult beetles in a recent experiment. Insects can resist cold increasingly as their bodies contain less water-bound colloids. The resistance of the fruit to low temperature has to be taken into consideration. Apples, citrus and mangoes, for instance, will resist refrigeration while peaches are extremely susceptible.

1067. SOUTH AFRICA, UNION OF. 634.1/7 : 382.6

**Fruit production in the Union. Report No. 20. The 1936-37 deciduous fruit export season.**

*Bull. Dep. Agric. S. Afr.* **187** (*Plant Industry Series 30*), 1939, pp. 138.

Figures are given of exports from S. Africa of the following fruits :— apples, apricots, grapes, nectarines, peaches, pears, pineapples, plums and prunes, and comments are made on particular fruits and shipments throughout the season.

1068. RASMUSSEN, M. P. 658.8 : 634.1/7 + 635.1/7

**Marketing fruits and vegetables on farmers' markets, New York metropolitan district.**

*Bull. Cornell agric. Exp. Stat.* **709**, 1938, pp. 60.

A majority of growers patronizing the farmers' markets, of which there are three in New York City, operated farms within 50 miles of these markets. Almost 96% of the tonnage consisted of vegetables and about 4% of fruit. Nearly three-quarters of the tonnage arrived during the period July to November. Of the produce sold by the 267 growers surveyed approximately 89% was marketed on farmers' markets in New York City, the motor truck being practically the only means of transport. Gross sales per ton on produce sold by the growers was about \$2.90 per ton higher on produce sold on the wholesale markets than on the farmers' markets, but the net returns were about \$1.11 per ton higher on farmers' market sales. Net return on sales at the farm were much higher than either on wholesale or farmers' markets, but possibilities of sales in volume at the farm were very limited. Cost of marketing per ton did not necessarily increase with distance from market. There was a direct relationship between size of average load hauled at one time and cost of marketing.

1069. RAEBURN, J. R. 634.11 : 658.8  
**Joint correlation applied to the quality and price of McIntosh apples.**

*Mem. Cornell agric. Exp. Stat.* 220, 1939, pp. 44.

A large number of observations on preferences and prices are made and various suggestions are put forward, presumably for the benefit of the apple grower. The number of conditions attached to most of such suggestions, however, makes one feel that a translator is needed before the luckless grower can gain appreciably from this mass of statistically treated observations.

1070. HOLLANDS, H. F. 634.13  
**Washington pears on the New York and Chicago fruit auctions.**

*Bull. Wash. agric. Exp. Stat.* 361, 1938, pp. 36.

Pears concerned are mainly Bartlett, d'Anjou and Winter Nelis, with smaller quantities of Bosc, Flemish Beauty, Comice and others.

1071. DEGRAFF, H. F. 634.25  
**The peach enterprise in Western New York : soil relationships, costs and returns, and marketing.**

*Bull. Cornell agric. Exp. Stat.* 710, 1939, pp. 37.

The information given here concerns the economic rather than the cultural side of peach growing in Western New York State bordering on Lake Ontario. The costs of each operation are considered in detail. It was found that 42% of the cost of producing the 1936 crop, mainly Elberta peaches, was for labour, half of this being for growing and half for the harvesting, packing and marketing. Interest, taxes, depreciation, etc., came to 23% and materials such as manure, fertilizers, cover crop seed, spray ingredients to 13%. No other item amounted to 10% of the total cost.

### PROCESSING AND PLANT PRODUCTS.

1072. FANELLI, L. 634.23-1.56 and 664.85.23.035.7  
L'industria delle ciliegie solforate in provincia di Bari. (**The sulphured cherry industry in the province of Bari.**)

*Memoria Staz. agrar. sper. Bari* 30, 1938, pp. 32, bibl. 29, being *Pubblicazione 196.*

In the period 1928-36 the average annual value of sulphured cherries exported from Italy amounted to over £200,000 and slightly exceeded that of fresh cherries. Nearly half of these came from the province of Bari. Some 6 varieties appear to be particularly suitable for the purpose and are gradually tending to be used to the exclusion of others. Cherries should not be too ripe or too highly coloured. The fresh cherries are first bleached with sulphur fumes and then have their stalks and stones removed. Both before and after stoning they are kept in wooden barrels with a capacity of over 2 quintals (a quintal=100 kg.) and containing a measured strength of sulphurated water. Before being stoned the cherries are graded by size into 4 groups. At the end of processing the cherries must be stoneless, quite bleached, unmarked and unbroken. One quintal of fresh cherries will produce 65 kg. of finished product. 80% of the product goes to the United States. During the different processes nearly all the sugar in the cherries (8-10%) passes by diffusion of the protective liquid and is removed with it, a fresh solution of sulphur dioxide taking its place. This means a considerable loss, and although no method of fermenting this lost sugar economically has yet been devised, it is suggested that a great saving would be achieved by using the same protective liquid into which the cherries are first tipped for the stoned cherries also. This would avoid loss of water, sugar and sulphur. All that is apparently necessary to achieve this is a filter. The entire process prior to shipment is described in some detail.

1073. SAVASTANO, G. 634.63-1.563.2  
Le séchage des olives noires de Ferrandina. (Drying the black olives of Ferrandina.)

Reprinted from *Bull. mens. Fed. internat. Oléiculture* 9, 1937, pp. 211-22.

A series of experiments are described from which an efficient method of drying the black olive of the district of Ferrandina, Italy, on a commercial scale has been evolved. (a) Immerse the olives for from 1 to 5 minutes in a boiling 10% brine solution; (b) drain off the brine for several hours; (c) dry in the reversible plane drier at a temperature of 70-80° C. This drier has been selected from a number as being cheap and easy to run. It is described in some detail and illustrated.

1074. SOLIVEN, F. A., AND DE LEON, A. I. 634.61-1.56  
Liberation of coconut oil through bacterial agency.

*Philipp. Agric.*, 1938, 27 : 200-15, bibl. 4.

A method of liberating oil based on the proper dilution of coconut milk and on the action of bacteria is suggested. The oil obtained was water-white and almost odorless. The yield almost corresponds quantitatively with that from the expeller method. The oil was produced by the de-emulsification of coconut milk after proper dilution and inoculation of bacteria which had been isolated from fermented coconut milk and kept in pure cultures. While oil may be produced in some cases by proper dilution alone of coconut milk, inoculation of the bacteria gave a larger yield of oil. The method was successfully applied on a semi-commercial scale. The high grade of oil obtained suggests the possibility of the oil being used for many industries demanding clear, colorless, and odorless oil. The residue after the aqueous layer has been evaporated suggests new by-products obtainable by this process. [Authors' summary.]

1075. CHARLEY, V. L. S. 663.3

Fermentation control of ciders by the centrifuge method. Relationship between changes in nitrogen content in juices and ciders and the subsequent rates of fermentation.

*A.R. Long Ashton Res. Stat. for 1938, 1939*, pp. 174-87, bibl. 3.

Early contributions in the Long Ashton reports in 1930, 1931, and 1932 were concerned mainly with the effect of the centrifuge on the rate of fermentation and no attempt was made to determine the exact nature of the mechanism whereby the check in fermentation was achieved. In later work this has received attention. The author summarizes as follows:—Apple juices of widely differing rates of fermentation were centrifuged at varying specific gravity intervals. Effectiveness of fermentation control by the centrifuge method was correlated with the nitrogen content of the fresh juice (0.018-0.0053%); high-nitrogen juices respond to centrifuging to a lesser degree than those with lower percentages of nitrogen. Varying amounts of nitrogen were removed by the centrifuge treatment. With a juice containing a low nitrogen percentage (0.0053%) a single centrifuging at various lower gravities used was sufficient to retain the different ciders in a stable condition. Whilst the centrifuging of juices direct from the press removed very variable amounts of nitrogenous compounds, the passage through the centrifuge of fermenting ciders effected the removal of amounts up to 96% of the total nitrogen.

1076. CHARLEY, V. L. S. 663.813 : 634.11  
Investigations on fruit products. XV. Experiments on the production of unfermented apple juice 1938.\*

*A.R. Long Ashton Res. Stat. for 1938, 1939*, pp. 188-203, bibl. 1.

The experiments here described were planned to give some light on the following points:—whether the heat treatment previously used could be reduced in degree and duration and secondly whether the efficiency of the pasteurization process was at all prejudiced by the sterility of the vessels being filled from the pasteurizer outlet. The author summarizes as follows:—A large bulk of apple juice produced from culinary (75%) and cider (25%) fruits was processed in 26 different ways, including cold sterilization, pasteurization in bottle, and flash pasteurization

\* Including some results for 1939.

into bottles of varying sterilities treated as follows:—(i) Washed and rinsed bottles; (considerable and varying amounts of yeasts and moulds); filled cold. (ii) Washed and rinsed bottles, steamed to 120°-150° F.; (practically sterile); filled hot. (iii) Washed bottles, rinsed with 2% SO<sub>2</sub> and drained 1 minute (more sterile than ii or iv); filled cold. (iv) Washed and rinsed bottles, rinsed with 2% SO<sub>2</sub> and finally rinsed with sterile water (similar sterility to ii); filled cold. Satisfactory sterility of the bottled product was obtained in 98% of bottles filled by the cold process, 100% of bottles in which the juice had been pasteurized in the container, and in varying percentages of the flash pasteurized juices. Pasteurization at 185° F. for 30 seconds followed by immediate cooling and filling at 160° F. into hot steamed bottles gave a satisfactory product, but the sterility of the other products was affected to a considerable extent by the flash pasteurization and filling temperatures and by the sterility of the bottles into which the juice was filled. The flavours of juices pasteurized at the highest temperatures were preferred by a flavour panel both to those of juices pasteurized at lower temperatures or in bottle, and also to the cold processed juice. . . .

1077. CHARLEY, V. L. S. 633.813 : 634.11  
**Impressions of the German apple juice industry.**  
*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 204-12.*  
 The apple juice industry in Germany is virtually controlled by one organization which has complete power over the disposal of all fruit and vegetables. It issues licences for manufacture of juice, examines factories and imposes standards, which must be observed. Propaganda in the shape of advertisement is almost nil: the product has sold itself. Fruit is generally low grade material, rather more acid than English dessert varieties but less acid than the Bramley's Seedling. Factories are on a fairly small scale. Mills and presses are very advanced in design. Most of the juice is sold clarified by centrifugation. Both the hot and cold processes are used for stabilizing and storing. The juice is always served cold, a very essential condition for it to become and remain popular. The author goes into detail on all the above points.

1078. BARKER, B. T. P. 663.81  
**The Long Ashton contribution to the development of pure fruit products.**  
 MOREL, R. C.  
**World developments in fruit juice production and the present English industry.**  
 NORBURY, C. P.  
**Fruit juice standardization.**  
 CHARLEY, V. L. S.  
**Pure fruit juices and syrups: their methods of manufacture, chemical composition and significance from nutritional and medical points of view.**  
*A.R. Long Ashton Res. Stat. for 1938, 1939, pp. 213-9, 220-5, 226-30 and 231-48.*

In a conference of fruit juices held at Long Ashton Research Station on 23 March, 1939, the above four papers were given. In the first Barker shows how the work of fruit products has developed at Long Ashton.

Next Morel deals with world developments in fruit juice production and shows that there are three main influences which have encouraged the rapid growth of the industry in the last ten years, namely the availability of plenty of fruit for by-product use, advance in technical knowledge and skill, and growing appreciation of fruit products by the consumer resulting from his increased knowledge of their value to health.

Norbury stresses the necessity for legal standardization of fruit juices in the interests of fruit grower, juice manufacturer and, not least, consumer. Fruit growers and the fruit juice and syrup industry are preparing standards for apple juice, which with the support of the Ministry of Agriculture will be presented to the Minister of Health, when it is hoped an order will be made under section 8 of the New Foods and Drugs Act of 1938.

Finally Charley deals with methods of manufacture, chemical composition and significance from nutritional and medical points of view.

1079. TSEREVITINOV, S. F. 663.8 : 635.1/7

**Vegetable juices.** [Russian.]*Vegetable growing, Moscow, 1939, No. 6, pp. 31-4.*

Pasteurization is the more common method of making tomato juice in U.S.S.R. Next in importance to tomato juice comes carrot juice, for the manufacture of which a special method has been developed. After washing, carrots are left for 5 to 10 seconds in hot 1-3% solution of caustic soda for removal of sand, soil, micro-organisms and the skin. After this they are cut and pressed. The juice and the carotene, which sinks to the bottom of the container, are immediately bottled and frozen, and stored at  $-18^{\circ}$ . The juice loses its best properties when left unused for over 12 hours after thawing.

1080. MAYER, M. I. 633.88 : 581.192

*Contributiuni la studiul substantelor minerale din drogurile vegetale oficinale.*  
(A contribution to the study of the mineral content of medicinal vegetable drugs.) [Summary in French 2 pp.]

Tipografia Legatoria "Furnica" Șoseaua Colentina 39, Bucharest, 1938, pp. 70, bibls. numerous.

The ash analysis of some 56 vegetable drugs has been made and is recorded here. The author confirms the finding of earlier analysts that the aerial parts of a plant are richer in minerals than the roots and tubers, that the bark and seeds contain the least minerals, and that flower stalks are intermediate. Among ash constituents K and Ca are the most important, Fe occurs in very small amounts, bark contains much Ca, while seeds are rich in K, P and Mg. The limits of variation in ash content within plants of a given family cannot be strictly defined. The results obtained should help in identifying different drugs and the detection of fraud especially in the case of powders. The influence on ash constituents of the time of picking, soil and species is shown.

1081. UNITED STATES, SECRETARY OF AGRICULTURE. 633.71 : 382.6 + 631.57

**Export trade in and by-products uses of tobacco.**

U.S. Government printing office, Washington, 1939, pp. 56.

A report submitted to the United States Senate at the 76th Congress by the Secretary of Agriculture. Most of it concerns factors affecting the consumption of American tobacco in different countries and possible methods for increasing this consumption. As regards by-products up to the present the only ones which have found successful application are those within the group of the nicotine compounds, tobacco sauce, horticultural dusts and sprays and fertilizers. Possible developments in the encouragement of the manufacture and use of by-products are discussed.

1082. BOLIN, D. W., AND SCHROEDER, W. 664.84.656 : 581.192

**The calcium-phosphorus ratio of the skins of canning peas and its relation to maturity.***J. agric. Res., 1939, 58 : 631-5, bibl. 13.*

The investigations described here were made in the attempt to facilitate methods for determining the maturity and quality of raw peas for canning purposes. The data obtained show that the calcium content and the calcium : phosphorus ratio of the skins increases and the phosphorus content decreases with maturity.

1083. KNOTT, J. C., MURER, H. K., HODGSON, R. E., AND OVERHOLSER, E. L. 634.11 : 636.085.52

**The digestibility and feeding value of apple and apple-alfalfa silage.***Bull. Washington agric. Exp. Stat. 362, 1938, pp. 20, bibl. 14.*

The experiments described here suggest that cull apples can be effectively used as feed for dairy cows by ensiling them with alfalfa hay in the proportion of 80% apples to 20% alfalfa hay.

1084.	HOUW, T. S. Verwerking van <i>Aleurites</i> -vruchten. ( <b>Processing tung nuts.</b> ) <i>Landbouw</i> , 1939, 15 : 88-90, bibl. 7.	633.85-1.56
	FRAHM, E. D. G., AND KOOLHAAS, D. R. Samenstelling en onderzoek der <i>Aleurites</i> -oliën. ( <b>Composition and investigation of tung oil.</b> ) <i>Landbouw</i> , 1939, 15 : 69-87, bibl. 22.	633.85
	VAN KONIJNENBURG, E. De positie van tung-olie op de markt voor drogende oliën. ( <b>Position of tung oil in the drying oil market.</b> ) <i>Landbouw</i> , 1939, 15 : 91-4.	633.85-1.56

## NOTES ON BOOKS AND REPORTS.

1085.	TRESSLER, D. K., JOSLYN, M. A., AND MARSH, G. L.	663.8 + 663.813
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***Fruit and vegetable juices.***

Avi Publishing Company, New York, 1939, pp. 549. Numerous bibliographies, price outside U.S.A. \$6.25.

Horticultural workers and executives in factories dealing with fruit products have been forced during the past 10 years to rely on University agricultural bulletins from America and the two classic books on general fruit products by Cruess and Campbell for their information on the new developments in the fruit juice industry. The development of this industry can only be described as phenomenal. In America, the country where the increase in production has been most marked, fruit juices were packed only in insignificant quantities prior to 1925. The following year saw the introduction of canned grapefruit juice and in four years this industry alone had grown to enormous proportions. In 1928 tomato juice was introduced and quickly became so popular that it became a best seller. To-day over fifteen million cases of tomato juice are packed annually, this quantity representing a volume almost as great as the entire production of all other fruit juices taken together. It was not until 1931 that pineapple juice of really good quality was made available. A three-year period was necessary for this particular product to gain widespread acceptance but to-day the production is such that pineapple juice ranks amongst the three most important commercial liquid fruit products in the United States. Behind this amazing development has been the works technician and the research workers belonging to the various co-operative firms of fruit growers and the teams connected with the University Agricultural Colleges. Literature has been amassed at a rate proportional to the development of the industry and for this reason alone the publication of the book under review is especially valuable, coming as it does at a period when practically every country which grows fruit is concerned over the question of the utilization of part of the crop.

*Fruit and vegetable juices* has been written by fruit products experts associated with two of the chief centres of development in America, namely the Geneva Agricultural Station (New York) and the Berkeley Agricultural Station in California. The names of the authors are sufficient in themselves to guarantee that the information is up to date and accurate.

The book deals with the whole story of fruit juices. Valuable information which is only obtainable with difficulty elsewhere is given with regard to American statistics and whilst throughout the book the American methods are given predominance, reference is made to developments in England and Germany with respect to processing details. An exceptionally useful chapter is included on plant lay-out. Many considerations which would probably be overlooked by a firm starting fruit juice production are discussed and the final suggested scheme for lay-out represents a well-thought-out and admirable plan for factories of various types. The details of manufacture are given for the complete range of citrus juices and berry and currant products. It is interesting to read on page 157 that the large production of pineapple juice is being processed

largely by methods developed by the research staffs of the Pineapple Canneries in Hawaii, such methods having been kept secret. Members of horticultural staffs in the Dominions, Colonies and Dependencies of the British Empire will find this section of the book of great use for it is inclusive and gives consideration to many products which have not yet been popularized in America, i.e. passion fruit juice and pear nectar.

One point of interest arises from the statement on page 265 that cold processed Concord grape juice must be heated sufficiently to inactivate the enzymes if undesirable changes in flavour are to be prevented. This appears to be directly contrary to the experience in Germany where practically the whole output of grape juice is processed entirely by the cold method.

The chapter on sauerkraut and other vegetable juices gives for the first time a detailed examination of the methods for producing these products. In this chapter the authors have wisely given copious quotations from the actual publications concerned with the result that the information is in such a form that makes it readily available to works chemists or research workers dealing with this problem.

The nutritive value of fruit and vegetable juices is dealt with in an exhaustive way from the chemical point of view although there is the usual lack of direct medical evidence which seems to be a characteristic of this subject no matter where the work is done. This chapter provides a happy hunting ground for those who are interested in the nutritive value of these products from the point of view of attempting to market juices and syrups which retain to the fullest extent the nutritive values of the fresh fruits. In view of the general excellence of this chapter it is disappointing to find that the fruit with the highest content of vitamin C (the black currant) is entirely omitted from the list on page 343 of fruits especially high in this accessory food factor, whilst it would also appear that many of the fruits included in this list cannot really be regarded as valuable sources of this vitamin. An interesting observation regarding the necessity of including uronic acid in the diet as a means of self-defence against various disorders and diseases is of especial interest at the present time when vast strides are being made in elucidating the constitutional chemistry of the pectic materials and these researches are being applied to the method of production of juices with a view to retaining the pectin complex in the juice.

The mineral water trade will find a full statement concerning concentrates and syrups together with the diluted beverages made therefrom whilst the utilization and disposal of fruit wastes is dealt with from the point of view of solid fruit products, essential oils, fixed oils and pectin.

Two most valuable features of the book are the extensive and very up-to-date bibliographies associated with each chapter together with the 80 illustrations which are in general well reproduced and deal largely with processing details.

It is pleasing to pay the highest tribute to this book. Text books of this sort do not usually make easy reading but in this case the points are clearly stated and the printing and format are excellent. The book should be of the greatest possible use to anyone associated either from the fruit or factory angles of this new fruit juice industry.

V.L.S.C.

1086. LAWRENCE, W. J. C., AND NEWELL, J. 631.531 + 631.532/5  
***Seed and potting composts.***

George Allen & Unwin, London, 1939, pp. 128, 3s. 6d.

We do not think the old-fashioned gardener, if he still exists, is going to like this book. No one cares to have their cherished mysteries debunked and this in effect is what the authors at the John Innes Horticultural Institution have done for all the range of special composts beloved of ancient horticulturists. They set out to show that one compost will do for nearly all potted and boxed plants while the same compost with some slight modifications (not always necessary) will raise most seeds. In fact, as one felt Sir Daniel Hall was refraining from saying in his foreword, they have reduced this aspect of gardening from an art to a mere science. As a gardener he possibly sees the old traditions fade with some regret. But as a scientist Sir Daniel regards the authors' work as "one of the most exact and valuable pieces of science applied to horticulture that has fallen within my experience". Not content with producing

a standardized potting compost the writers have also devised a standard liquid feeding mixture which shows that "the great variety of fertilizers including manure water is redundant", the only condition being that it must be used with the John Innes composts for best results. The early chapters of the book are explanatory and deal with the plant's food and the sources thereof, natural and artificial. The compost materials used are then discussed over several chapters. There are three chapters on various methods of soil sterilization which is a necessity in exact scientific work (but not essential to the use of the composts) and finally the feeding of pot plants and glasshouse hygiene is described. There is no doubt that the discoveries made will be of considerable importance in simplifying an important part of the grower's routine while ensuring him, it is claimed, optimum results with absolute certainty. We have deliberately refrained from mention of nature or quantities of the few simple ingredients used. It is worth three and six of anyone's money to find out.

1087. MITCHURIN, I. V.

634.1/8-1.523

***Mitchurin's selected works.*** [In Russian.]

Voronezh Region Publishers, Voronezh, 1939, pp. 373, 12 roubles.

Different problems are discussed which arose during the author's 60 years' work on the improvement of fruit tree varieties in Central and Northern Russia. His importance as a practical breeder need not be discussed, since the very large number (over 300) of different fruit forms and varieties, introduced by him and now grown commercially, speak for themselves. Mitchurin's chief merit, however, lies elsewhere, namely in the original way in which he approached certain problems. *Hardiness.* The method of acclimatization (Grell) consisting of grafting scion varieties to hardy stocks has been found useless under Central and Northern Russian conditions. The only way to obtain plants that adapt themselves to the severe climatic conditions in Mitchurin's experience is to raise seedlings from seed obtained locally. Seedlings are more adaptable where crosses are made between more distantly related forms. Where no local forms of a certain species are available for hybridization with fine European varieties, forms should preferably be used which originate from countries having similarly severe climatic conditions. *Breeding.* Mendel's laws were not always found to be applicable to fruit trees. A great point is made of the use of "mentors", or factors temporarily affecting the nature of young hybrids. Such factors are stock or scion influence on young hybrid plants or the effect of pollen from older plants and long established varieties in the early life of the hybrid. Much importance is attached to the surroundings in which the seedlings are raised, e.g. seedlings from the crosses with tender southern varieties become less adaptable when grown under favourable conditions (soil, nutrients, etc.). Storing the seed even for one year and under the best possible conditions was found detrimental, hybrids obtained from such seed having many inferior characters. Drying the seed had a similar effect.

1088. EWERT, —.

638.12 : 581.162.3

*Die Honigbiene als wichtigste Gehilfin im Frucht- und Samenbau. (The bee and its use in fruit and seed formation.)*

Verlag Leipziger Bienenzeitung, Leipzig, R.M. 0.60.

The beneficial effect of bees on yield of various fruit trees, bush fruits, vegetables and forage crops is discussed. Recommendations are given for the prevention of cross-pollination by bees of certain vegetable varieties grown for seed.

1089. TURNBULL, J.

632.95

***Commercial fruit tree spraying.****Bull. Minist. Agric. Lond.* 5, 1939, pp. 76, bibl. 25, H.M. Stationery Office, Kingsway, London, 1s. 6d.

In this, the fourth edition of the bulletin, Mr. Turnbull has produced a work that should instantly appeal to the practical man. It is confidently recommended to progressive fruitgrowers, and

to all students of fruitgrowing who have to wrestle with spray-costings for examinations. The author, moreover, not only covers every aspect of spraying but also has command of a simple, very readable style that makes the reading of intricate technical details a pleasure rather than a penance. His well-known enthusiasm for the economics of spraying is not only felt by but is imparted to the reader, and his attention to detail will be fully appreciated by those who daily face the many problems that spraying involves, as will the subtle, ironic humour that here and there enlivens his logical account of the sequence of events in the spraying "revolution" of the last decade. It probably will not be realized from the script that Mr. Turnbull himself is largely responsible for this revolution. He frequently stresses a fundamentally sound principle—that of interesting the man who is doing the work in what he is doing and why he is doing it. Not the least important factor in Mr. Turnbull's successful pioneer work in this country lay in his ability to do this, for by his method of approach he soon had the spray-men on his side. His extensive investigations in recent years have given him an intimate knowledge of the problems and of their practical solution and consequently the present edition of the bulletin has gained a marked note of confidence over its predecessors, which were necessarily written in a much more tentative vein. The bulletin is conveniently and logically divided up into five main sections:—(1) An introduction, in which the author sums up the urgent need for much better spraying methods. (2) General considerations, in which the many problems are reviewed as a whole. (3) Methods of spraying, a particularly fine dissertation on the gradual evolution from one stage to the next in the improvement of methods, together with reasons for each. (4) Machinery and plant, in which the different types of machine, what it costs to use them, and their advantages and disadvantages for different kinds of work are very clearly described. (5) Total cost of spraying, a detailed analysis of costings that every fruitgrower will find very helpful. Finally, a short note on dusting and atomization is followed by a useful list of references to other work on spraying. There are 15 photographs illustrating types of machinery and nozzle performance, and several, but not too many, tables of figures. It should be emphasized that the small grower is not neglected. All kinds of machines and methods of spraying are discussed, although, as the title suggests, there is naturally more emphasis on large- than on small-scale operations. In fact, the larger the acreage, the more need is there in spraying for speed coupled with economy and efficiency, and this is the author's keynote.

M.H.M.

1090. STOCKDALE, F. 551.566.1 : 63

**Report on a visit to Malaya, Java, Sumatra and Ceylon 1938.**

*Colonial Advisory Coun. Agric. and Animal Health, C.A.C. 454, 1939, pp. 108.*

In this report Sir Frank Stockdale discusses and, where necessary, constructively criticizes the agricultural conditions of the countries named in the title. The report is of much interest, in particular, that portion dealing with the Netherland Indies contains a very useful survey of the agricultural research so actively carried on by the Dutch. The section on the cultivation of *Cinchona* in Java provides information on the successful methods of the Dutch with cinchona which will prove useful to those engaged in work on this crop in various parts of the Colonial Empire.

1091. IMPERIAL ECONOMIC COMMITTEE, LOND. 665.3

**Vegetable oils and oilseeds. A summary of figures of production, trade and consumption relating to cottonseed, linseed, soya beans, groundnuts, copra, oil palm products, olive oil and other oilseeds and oils.**

H.M. Stationery Office, Kingsway, London, 1938, pp. 116, 2s. 6d.

Figures, even of oil movements, are inclined to be dry, but the information given here, not only of imports and exports of oils and oilseeds but also of the nature and use of different oils and factors affecting their increase or decrease on the world market, is of fascinating interest and no budding oil magnate should be without a copy.

1092.	IMPERIAL ECONOMIC COMMITTEE, LOND.	633.88 + 664.5 + 668.52 + 633.5 + 668.44 + 665.3 + 667.211.4 + 634.98
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***An index of the minor forest products of the British Empire.***

H.M. Stationery Office, Kingsway, London, 1936,\* pp. 116, bibl. numerous, 5s.

As minor forest products are understood the product of the natural forest other than timber and its derivatives. In each country of the Empire lists were drawn up of such products known to be available, distinction being drawn between those in which an export trade had been established from those of only potential value. The result correlated and tabulated is this bulletin. The products covered are drugs and spices, dyes, essential oils, fibres, gums and resins, oils and oilseeds, tanning materials and miscellaneous.

1093.	MINISTRY OF AGRICULTURE, LONDON.	016 : 63
	<b><i>A selected and classified list of books in English relating to agriculture, horticulture, etc., in the library of the Ministry of Agriculture.</i></b>	
	<i>Bull. Minist. Agric. Lond.</i> 78, 1939, pp. 27, 6d. and MINISTRY OF AGRICULTURE, LONDON.	017 : 05 : 63

***List of periodical publications received in the library.***

January 1939, pp. 49 (stencilled).

Those who take advantage of the Ministry's excellent and accessible library will be grateful both for these two publications, which not only show what books (in English), bulletins and periodicals are available there but also afford a very useful guide to anyone wanting to buy literature on any given phase of agriculture. The books are classified according to subject and the periodicals under country of origin alphabetically according to the name of the particular publication. Our only suggestion for improvement is that in future issues of the list of periodicals information should be given on the dates or numbers from which each periodical is available.

1094.	NEW SOUTH WALES.	05 : 63
	<b><i>Catalogue of the periodical literature filed in the Library, Department of Agriculture, New South Wales.</i></b>	

David Harold Paisley, Government Printer, Sydney, 1938, pp. 132.

1095.	FRANSEN, J. J.	632.48 : 634.972.8
	<i>Iepenziekte, iepenspintkevers en beider bestrijding.</i> † (Transmission of the elm disease.) [English summary 8 pp.]	

H. Veenman &amp; Zonen, Wageningen, 1939, pp. 118, bibl. 100.

The direct control of elm disease caused by *Ceratostomella Ulmi* appears to be impossible. It is found, however, that the elm bark beetles, *Scolytus scolytus* and *S. multistriatus*, are the chief vectors of the disease and where they do not occur the disease also is absent. It is reported how, aided by legislation, the control of the beetle has been started. This is done by destroying bark containing larvae, burning and by barking or immersing in water wood suitable for beetle breeding.

1096.	PALESTINE.	63
	<b><i>Concise survey of agriculture in Palestine.</i></b> (Stencilled.)	

Audit Union of the Workers' Agricultural Co-operative Societies Ltd., Tel-Aviv, P.O.B.210, 1939?, pp. 11.

An account is given of the types of farm in the different parts of Palestine. The total area under cultivation in 1936/37 was as follows :—Cereals and legumes 625,000 ha. ; fruit trees 135,000 ha.

\* The Bureau regrets that it has only recently received this valuable compilation. For other abstracts on forestry see inside of back cover.

† Doctor's thesis, Wageningen.

including citrus 30,000, olives 50,000, vines 18,000, melons 17,000 and figs 10,000 ; vegetables 15,000 ha. ; fodder crops 9,000 ha. ; tobacco 6,000 ha.

1097. INTERNATIONAL INSTITUTE OF AGRICULTURE. 027 : 63

*International directory of agricultural libraries.*

International Institute of Agriculture, Rome, Villa Umberto I, 1939, pp. 311, 25 liras.

Agricultural libraries seem to exist in the most unexpected places. Details of most of them will be found in this latest publication of the Rome Institute, entitled International directory of agricultural libraries. In it an attempt is made, with varying success, to supply information with regard to each library on many points including the following :—(1) history of library ; (2) composition, including number of books, pamphlets, current periodicals and any special collections, noted separately ; (3) catalogue and classification systems used ; (4) rules regarding loans, hours of study, etc. ; (5) publications edited by the library.

Though much of this information is useful and of more than academic interest, with some the task of collection would appear to have been too great or even in vain. Thus the historical information is usually meagre, often consisting merely of the date of foundation. Again, the unceasing flow of agricultural literature and the abandon with which it is distributed renders a good deal of the statistical data on numbers of books, etc., almost immediately out of date, though doubtless it gives some idea of the size and scope of the library in question.

From the libraries described the reviewer has noticed one quite inexplicable omission. Under the heading Kew there is reference to the small specialized library of the Imperial Mycological Institute but no mention whatever of the library of the Royal Botanic Gardens, which must, surely, be one of the most comprehensive horticultural libraries in the world, not only for its books but for its unbroken runs of innumerable periodicals, mostly complete from the first issue. This omission somewhat shakes one's faith. As a guide and address book the present publication, which is in French and English, should prove very useful.

1098. PEARSE, H. L. 577.15.04 : 634/5

*Plant hormones and their practical importance in horticulture.*

*Tech. Comm. imp. Bur. Hort. Plant Crops* 12, 1939, pp. 88, bibl. 248, 3s. 6d.

This bulletin, which was compiled in response to numerous enquiries and in particular to the request of the Plant Hormone Committee of Kew, deals essentially with the practical application to horticultural crops of recent findings on the use of plant hormones.

The literature dealing with this work, including that of the author himself at East Malling, is thoroughly sifted. Thirty pages devoted to an index of some typical results obtained with various named species subjected to particular detailed treatments should form a useful guide to the propagator. Finally, for those wishing to study more closely any particular aspect of the problem the references cited should show the way.